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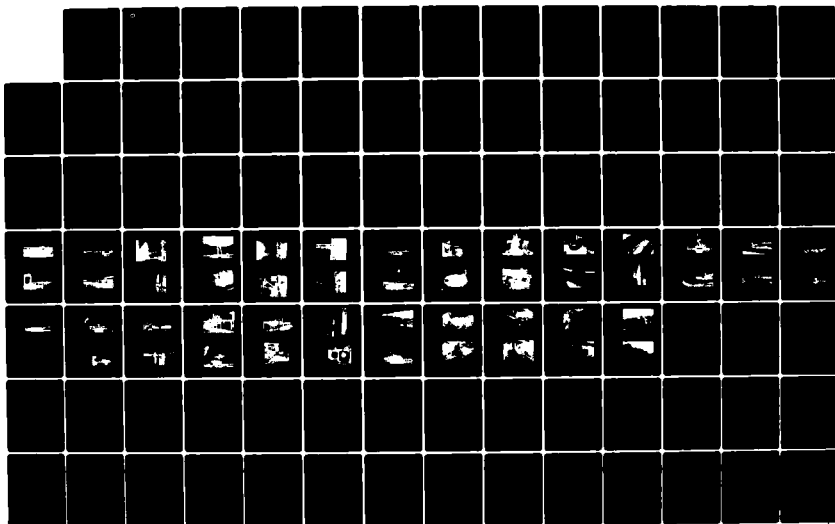
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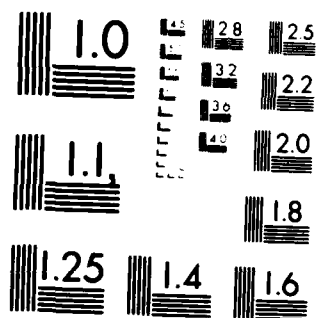
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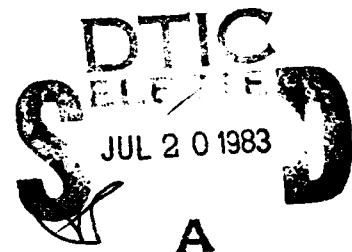
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NORFORK LAKE HIGHWAY BRIDGES BAXTER COUNTY, ARKANSAS

WHITE RIVER AND TRIBUTARIES NORTH FORK RIVER, ARKANSAS

FOUNDATION REPORT



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| Geology | Underwater T.V. inspection | "Cotton rock" |
| Rock socket | Core hole | Abutment |
| piles | Overburden | |
| pier | Excavation | |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) | | |
| <p>This report describes the foundation conditions and unique methods utilized in constructing the foundations for two large highway bridges over Lake Norfolk, Arkansas, to replace two ferry crossings on U.S. Highway 62 and Arkansas State Highway 101.</p> <p>Twenty-two of the two-columned piers were constructed in water up to 170 feet deep, with each column installed on 8' 4" diameter rock socket footings drilled a minimum of 20 feet into competent rock. Each drilled socket was</p> | | |

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inspected, logged, and mapped by means of a specially designed underwater television camera and monitoring screen.

The founding dolomite rock was for the most part sound, with occasional close to moderate fractures. Solution cavities, typical in dolomite, were encountered in several of the rock sockets. Special design criteria were established in plans and specifications to handle questionable rock conditions, and are explained in the report.

Since the majority of this work was performed in an existing fresh water lake it was a requirement to collect, separate, and dispose of drill water and cuttings without disturbing the ecological balance in the lake. The drill water was filtered through two barriers of Bidum C-42 fabric and cuttings were barged to land disposal sites.

The bridge abutments were founded on both piles and spread footings.

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DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

FOUNDATION REPORT
Norfolk Lake Highway Bridges
U.S. Highway 62 and Arkansas Highway 101

June 1983



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FOUNDATION REPORT
Norfolk Lake Highway Bridges
U.S. Highway 62 and Arkansas Highway 101

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PART I INTRODUCTION

1-01. Location and Description of Project. The Norfork Bridges Project is located in Township 20 North, Range 12 West in Baxter County, Arkansas, where United States Highway 62 and Arkansas State Highway 101 cross Norfork Lake. The project consists of two drilled shaft bridges of concrete and steel to replace ferry crossings on each of the two highways.

The Highway 62 bridge has a 44-foot-wide roadway which extends 3,460 feet from west to east in the SE1/4 of Section 27 and the SW1/4 of Section 26. The bridge has 13 piers with 8-foot-diameter columns spaced 40 feet apart from center to center. There are 12 piers built in water which are based on 8-foot-4-inch-diameter rock sockets that extend a minimum of 20 feet into sound rock formation. However, Pier 1 is land based on the west abutment with a spread footing. The girders connecting the piers are of 1/2-inch-thick steel in 13-foot-high "I" beams. The longest span is 255 feet, and the tallest pier is 198 feet. The greatest depth of a pier beneath water is about 153 feet.

The Highway 101 bridge has a 32-foot-wide roadway which extends 2,880 feet from southwest to northeast in the E1/2 of Section 22. The bridge has 11 piers with 8-foot-diameter columns spaced 28 feet apart from center to center. There are 10 piers built in water which are based on 8-foot-4-inch-diameter rock sockets that extend a minimum of 20 feet into sound rock formation. However, Pier 11 is land based on the northeast abutment with a spread footing. The girders, like those of Highway 62, are of 1/2-inch-thick steel in 13-foot-high "I" beams. The longest span is 310 feet and the tallest pier is 213 feet. The greatest depth of a pier beneath water is about 170 feet.

1.02. Construction Authority. The Norfork Bridges Project is authorized by Public Law 93-251, Section 15, which was enacted by the 93d Congress on 7 March 1974.

1.03. Purpose of Report. The objective of this report is to describe the foundation conditions encountered during the construction of both highway bridges, the methods of construction applied to these conditions, and be a consolidated record of the foundation-related construction operations. It is intended to provide information for evaluating any future structure problems or studies which may relate to foundation conditions, planning future foundation treatment (if needed), and be a part of the permanent project engineering and construction record.

1.04. Contractor and Contract Supervision. Massman Construction Company, of Kansas City, Missouri, was the principal contractor for all of the projects' foundation work under Contract No. DACW03-79-B-0019, dated 5 April 1979. Joyner-Cranford and Burke, of Little Rock, Arkansas, was the subcontractor for the foundation work on the bridges' abutments. McClelland Engineering Company, of Kansas City, Missouri, was subcontracted to drill seven core holes on the south abutment of the Highway 101 bridge. Hayes Drilling Company, of Kansas City, Missouri, was subcontracted to drill the pile holes in the Highway 101 South abutment.

The contractor was required to establish and maintain an effective quality control system consisting of plans, procedures, and organization to insure the contract requirements in materials, equipment, workmanship, fabrication, and construction operations. A quality control system manager from within the contractor's organization was required to be at the work site with responsibility for the regulation of all quality control matters. A fully qualified staff was required under this system manager with the proper experience and technical training to perform all quality control activities. Records and tests of the contractor's quality control for all construction operations were furnished to the Government as directed by the Contracting Officer. The entire work was subject to inspection and test by the Government at all reasonable times and at all places prior to acceptance. In addition, the project was required to be accessible at any time for inspection by personnel of the Arkansas State Highway and Transportation Department and the Federal Highway Administration.

1.05. References.

- a. Design Memorandum No. 3, Norfork Lake Highway Bridges, dated December 1976.
- b. Geotechnical Engineering Report, Norfork Lake Highway Bridges, Howard, Needles, Tammen and Bergendoff, dated December 1977.
- c. Natural Gamma-Ray and Caliper Logging, Norfork Lake Bridge Project, (Warren George, Inc.), Weston Geophysical Corp., dated July 1979.

PART II FOUNDATION EXPLORATIONS

2.01. Investigation Prior to Construction. Prior to the 1976 Design Memorandum No. 3, several alternatives for the proposed bridge sites were studied. Local geology, water well data, physical properties, and stress behavior characteristics of typical foundation rocks were studied in detail. Side wall slopes and rock outcroppings at the sites were examined before the reservoir was filled. A geophysical survey was performed across the lake portion of the proposed bridge sites. The survey consisted of high resolution subbottom profile with an electro-mechanical profiler, fathometer readings to obtain an accurate vertical profile of the lake bed, and side scan sonar to provide a plan view of the lake bottom.

The final design and preparation of plans and specifications were contracted to the Kansas City, Missouri architect-engineering firm of Howard, Needles, Tammen and Bergendoff under Contract No. DACW03-77-C-0051, dated 13 July 1977, which in turn subcontracted subsurface investigations to National Soil Services, Inc. of Houston, Texas. These investigations included laboratory soil tests determining the Unified Soil Classification, Natural Water Content, and Grain Size Analysis; Uniaxial Compression Tests on approximately 100 rock core samples; Standard Penetration Tests and Pocket Penetrometer Shearing Tests of soil in the field; Mohs Hardness and Schmidt Hardness field tests of rock samples, and a total of 39 drill holes for both bridge sites.

The 39 drill holes were distributed to investigate overburden and rock conditions at each pier site and on all four bridge abutments. The sites for Pier 1, Highway 62 and Pier 11, Highway 101 were located on dry land and drilled at each end of the long dimension for the designed spread footings. One boring was drilled at each water pier site, alternating in the right and left drilled shaft positions. However, the first 3 pier locations of Highway 101 required additional drill holes to better define more complex subsurface conditions. The drilling methods used a 6-inch helical auger, a tri-cone roller bit, and coring as applicable to overburden and rock.

Additional subsurface explorations were conducted from January to March of 1979 by Warren George, Inc. of Jersey City, New Jersey, under Contract No. DACW03-79-C-0011, dated 5 December 1978. These explorations consisted of 36 core holes at sites for Piers 2 through 13 on Highway 62 and for Piers 2 through 10 on Highway 101. The holes were drilled at the socket locations not covered by the previous explorations of National Soil Services, Inc. and at locations of suspected solution features between Piers 2 and 5 of Highway 101. Downhole geophysical gamma and caliper logs were conducted in these borings. (See references.)

NOTE: Boring logs of the 75 borings drilled prior to construction are not included in this report. These are included in the Geotechnical Report, reference 1-05b above, as well as the plans and specifications.

2-02. Investigations During Construction. During construction an HQ (3.790-in. dia.) core hole was drilled in the bottom of each rock socket. This was to determine whether a stable foundation existed for a minimum depth of 10 feet immediately below the socket. Most of the sockets required only one 10-foot-deep core hole, but there were a few exceptions, as follows:

a. Due to a cavity in the east socket of Pier 1, Highway 101, it was decided to lower the socket 8.0 feet below the designed bottom. Therefore, a core hole was drilled 18.0 feet into the designed bottom before the socket was deepened, to investigate the 8.0 additional feet of socket to be drilled and the 10.0 feet of rock which would be beneath the final bottom of socket.

b. Two core holes of 16.5 feet and 16.6 feet respective depths were drilled in the bottom of the west socket of Pier 5, Highway 101. These holes were drilled to confirm a cavity at about 16 feet below the designed bottom of socket as indicated by previous exploratory holes.

c. Two core holes of 11.2 feet and 10.2 feet respective depths were drilled in the bottom of the east socket of Pier 6, Highway 101. These holes were drilled to determine the extent of a small clay-filled cavity discovered in the socket floor during the underwater television inspection.

d. Two core holes were drilled in the bottom of the north socket of Pier 11, Highway 62. The first hole had to be abandoned before completion when the drill stem broke off in the hole near the 8.0-foot depth. A replacement hole was then drilled to a depth of 10.08 feet.

e. In some cases several attempts were made in starting the core hole, due to bowing problems with the extremely long drill stem and casing. The flexing drill stem and casing, reaching as much as 187 feet in length, would occasionally bind against each other or cause the drill hole to start at an angle. After drilling a short distance, these attempted holes would have to be abandoned, the casing would have to be reset, and another hole would have to be attempted until the required 10.0 vertical feet of core could be recovered.

Seven core holes were drilled at the Highway 101 south abutment to determine the top of rock for pile installations. Five holes in the footing area found the top of rock at depths ranging from 2.5 to 10 feet. Two holes at the wing wall footer sites indicated top of rock at 17 and 21 feet respectively. Boring logs of the core holes drilled during construction are included in Appendix C of this report.

PART III GEOLOGY

3-01. Regional Geology. The Norfork Bridges Project lies within the Salem Plateau on the southern flank of the Ozark Uplift. The uplift is formed by an elongated, asymmetric dome trending southwest across most of southern Missouri and into northern Arkansas as well as parts of northeastern Oklahoma. The dome has been slowly uplifted through geologic time, and subsequent erosion has created a maturely dissected terrain with closely spaced, steep-sided valleys between upland remnants of the Salem Plateau. The slight regional dip of formations in the Salem Plateau is normally radial outward from the apex of the dome which is located in the Precambrian St. Francois Mountains of southeast Missouri. The formations are near horizontal with an average dip between 20 and 50 feet per mile and are cherty Ordovician dolomites, which cover most of the Salem Plateau from the project area in north-central Arkansas northward to the Missouri River.

3.02. Formations. The only rock formations encountered in the project area were the undifferentiated Cotter-Jefferson City Dolomites of the lower Ordovician Period. These two similar formations account for up to 800 feet of the stratigraphic column. They are lithologically undistinguishable and consist mostly of crystalline, sometimes siliceous, thin to massive bedded, moderately hard to hard, gray to buff, occasionally sandy or slightly shaly, cherty, and sometimes vuggy or drusy dolomite. Occasionally, thin layers of sandstone or shale are interbedded with the dolomite.

3.03. Solution Features. Dolomite is a calcium and magnesium carbonate which is soluble in groundwater; therefore, geologic solution features are common in the project area as well as throughout the Salem Plateau. The solution activity is accelerated by the relatively high, near-surface, groundwater flow rates caused by the appreciable topographic relief of the Ozarks. Solution creates channels and cavities along bedding planes, fractures, and joints, and enlarges some open vertical fractures and joints to form deep chasms in the subsurface. Differential solution creates highly irregular bedrock surfaces in some areas, and pinnacles may develop having several tens-of-feet of relief. In places, considerable sections of dolomite rock appear to have been separated by solution from the in-situ formation to create large blocks of float in the overburden. These bedrock irregularities are generally concealed beneath a mantle of residual soil which was also formed by solution from the parent carbonate rock. The dolomite is usually an impure rock containing far less soluble inclusions of clay, sand, and chert. As the bedrock surface is reduced by groundwater solution, these less soluble materials are left to accumulate in a residue above the rock. This has formed the typical red sandy and often cherty clay overburden of the project area.

3.04. Structure. Structurally, the project lies within the rather stable Mid-Continent Area. The local formations dip up to about 100 feet per mile to the south, which is somewhat steeper than the average regional dip. There were no apparent faults in the bridge foundations. Occasionally, high angle, normal faults of small vertical displacement are found in the general project area, but they have no indication of movement in recent geologic time. The nearest large faults occur at the Norfork Dam about 8.3 miles to the south. The dam is built on a grabened fault block between two major northeast trending faults with vertical displacements ranging from 40 to 200 feet.

3.05. Seismicity. The project area is in a Seismic Risk Zone I (minor damage expected) and within about 50 miles of a Seismic Risk Zone II (moderate damage expected). This Seismic Risk Zone II is roughly concentric about a Seismic Risk Zone III (major damage expected) at the New Madrid-Rough Creek Fault area in southeast Missouri. The 1811 and 1812 New Madrid earthquakes which reached Intensity XII on the Modified Mercalli Scale were centered about 150 to 200 miles from the project. Only earthquakes of minor intensity have occurred within a 100-mile radius of the project in the last 100 years. Recently, on 20 January 1982, an earthquake occurred with an epicenter near Naylor, Arkansas about 85 miles south of the bridges. It registered 4.5 on the Richter Scale and was barely felt by some people in the project area. The bridge piers were designed to meet the seismic conditions of the area.

3.06. Bedrock Geology for Highway 62 Bridge. The undifferentiated Cotter and Jefferson City Dolomites of the lower Ordovician Period were the formations encountered throughout the Highway 62 Bridge foundation. The dolomite was generally thin to massive bedded, moderately hard to hard, gray to buff, moderately fractured and jointed with zones of frequent fracturing. Fracture and joint planes were often coated with iron or calcite deposits which indicated considerable healing. No slickensides or other signs of faulting were noted throughout the foundation. The dolomite was occasionally sandy, gradational to dolomitic limestone, or interbedded with thin layers of shale, siltstone, mudstone, or clay. A white, hard, tightly cemented quartzitic sandstone found in exploration borings for Piers No. 3 and 11 was also encountered in sockets for Piers Nos. 2, 3, 4, and 12. It appeared to be in lenticular deposits which varied in thickness from less than a foot to 3.9 feet. Chert and flint were relatively common and occurred in both nodules and layered strata. Vugs and druses often occurred in zones and were usually lined with crystals of quartz, calcite, or dolomite. Solution cavities occupied several square feet in some of the socket walls, but none were large enough to create problems. Although many of the cavities were open, some were clay filled, especially those near the top of rock. Weathering at the top of rock was generally slight to moderate.

3-07. Overburden for Highway 62 Bridge. Overburden consisted primarily of residual and colluvial soils along the valley slopes and alluvial soils over the valley bottom. However, the soil beneath the reservoir level is undoubtedly reworked in places by the lake water to form new lacustrine deposits. The residual soil consists of a red clay containing sand and chert fragments which has been derived from the bedrock by solution and other weathering processes. Colluvium is formed along the valley slopes by residual materials moving downslope under the influence of slopewash and mass-wasting such as soil creep. The alluvial soils consist of sorted or semi-sorted deposits of clay, silt, sand, and gravel which comprises most of the valley fill.

The depth of overburden at the pier foundations ranged from 2.0 feet at Pier No. 13 on the east valley slope to 30.3 feet at Pier No. 8 in the valley fill. The residual and colluvial soils on the east valley slope ranged in depth from 2.0 feet at Pier No. 13 to 4.8 feet at Pier No. 12. However, the deposits on the west valley slope were considerably thicker and ranged in depth from 4.2 feet at Pier No. 1 to 27.7 feet at Pier No. 4. The deepest overburden was 30.3 feet in the alluvium at Pier No. 8, but Pier No. 9 had only 2.7 feet to 3.7 feet of alluvium. Otherwise, the shallowest alluvium was 17.1 feet at Pier No. 10 and depths usually ranged around 25 feet ±.

The depth of overburden was relatively shallow on both bridge abutments. On the east abutment overburden ranged from 3.5 to 17.5 feet deep, and on the west abutment it ranged from 0.5 to 9.5 feet in depth.

3-08. Bedrock Geology for Highway 101 Bridge. The bedrock of the bridge foundation on Highway 101 was generally similar to that on Highway 62. However, there were a few exceptions due to local formation variations, degree of fracturing, and solution effects.

The bedrock encountered throughout the foundation was the undifferentiated Cotter and Jefferson City Dolomites of the lower Ordovician Period. It was generally a thin to massive bedded, moderately hard to hard, gray to buff, moderately fractured and jointed dolomite which was occasionally sandy, gradational to dolomitic limestone, or interbedded with thin layers of shale. Hard, tightly cemented, white quartzitic sandstone was encountered in Piers Nos. 1 and 2. These appeared to be lenticular deposits which varied in thickness from less than a foot to 6.58 feet. Both nodules and layers of chert and flint were relatively common. Vugs and druses often occurred in zones and were usually lined with crystals of quartz, calcite, or dolomite. For the most part, weathering was slight to moderate except in extremely fractured and jointed areas.

Although there were zones of frequent fracturing throughout the foundation, the sockets for Piers No. 2 through 5 were the most intensely fractured. Weathering in this area was evidenced by considerable iron staining. Otherwise, fractures and joints were often healed with silica, carbonate, or iron oxide cement. No slickensides or fault displacements were noted in any of the fractures.

The first five piers contained several zones of a soft, porous, sometimes friable, yellow to buff to tan rock which was initially called siltstone. However, some of the material encountered in these soft rock zones appeared to be soft, weathered dolomite with the same structure as the surrounding formations. It has been noted that R. L. Heller (1954) described the Jefferson City Dolomite as commonly containing a "very fine-grained, thin to massive bedded, argillaceous to silty, gray to buff cotton rock". "Cotton rock" is defined by the American Geological Institute's Glossary of Geology (1974) as "a term used in Missouri for a soft, fine-grained, siliceous, white to slightly gray or buff magnesian limestone having a chalky or porous appearance that is suggestive of cotton". This definition closely fits the soft, porous rock which was described as siltstone in the field logs and previous reports on the Highway 101 Bridge foundation. The occurrence of this rock in the most fractured and jointed area of either bridge foundation suggests that the cherty, often siliceous dolomite was subjected to intense solution activity giving it the altered cotton rock appearance. An x-ray diffraction analysis was conducted on a small sample taken from soft rock zone in the west socket of Pier 5. The analysis indicated that the sample was high in silica with small amounts of dolomite, mica, and iron. This could be interpreted as a weathered chert or a highly siliceous dolomite having most of the soluble dolomite leached away. In any case, the soft rock appears to be the product of solution weathering rather than a siltstone deposit.

There were both clay-filled and open cavities which varied in size, but only Piers Nos. 1 and 5 had any large enough to require design adjustments. The east socket of Pier No. 1 was deepened 8 feet due to a clay-filled cavity which had a deep pocket covering about 80 square feet of the socket wall. At Pier No. 5 the top of socket was raised 14 feet above design elevation due to deep recesses which occurred in the lower west socket. However, drilling action, time, and cuttings indicated that the recesses were probably caved-in areas of soft rock rather than solution cavities.

3-09. Overburden for Highway 101 Bridge. The general soils types and descriptions are the same for the overburden at the Highway 101 Bridge as for that at the Highway 62 Bridge. The valley slopes are covered with residual and colluvial deposits of red sandy and cherty clay. The valley fill consists mostly of alluvial deposits of clay, silt, sand, and gravel.

The depth of overburden at the pier foundations ranged from 2.9 feet at Pier No. 5 on the valley bottom to 52.2 feet at Pier No. 10 on the north valley slope. The overburden was thinnest near the center of the valley and thickened progressively toward the valley sides. Depth of overburden was no greater than 11.0 feet through Piers Nos. 4, 5, 6, and 7. Overburden on the south valley bottom was 16.3 feet to 26.5 feet thick at Pier No. 2. On the north valley bottom it was 22.2 feet to 23.0 feet thick at Pier No. 8. Overburden on the south valley slope was 18.7 to 19.5 feet thick at Pier No. 1. On the north valley slope it ranged from 24.4 feet thick at Pier No. 9 to 52.2 feet thick at Pier No. 10.

The depth of overburden varied considerably on both bridge abutments, but particularly on the south abutment where solution weathered pinnacles apparently existed. The depth of overburden on the south abutment ranged from 2.5 to 21.0 feet and on the north abutment it ranged from 15.0 and 27.5 feet.

3-10. Engineering Characteristics of Bedrock. The Unconfined Compressive Strength and the Modulus of Elasticity were considered the two most important and reliable parameters of the bedrock foundation. The Modulus of Elasticity was based on the slope of the stress-strain curve at a point equal to 50 percent of the ultimate unconfined compressive strength which tends to represent a linear stress-strain relationship. From laboratory tests on rock cores and other data obtained from the subsurface investigations, the Modulus of Elasticity was found to range from 112,000 TSF (tons per square foot) to 400,000 TSF. A general Modulus of Elasticity of 125,000 TSF was considered reasonably applicable for both bridge foundations with a Maximum Allowable End Bearing of 35 TSF at the socket bottom. However, no side friction was included in developing the axial capacity, and considerable support would actually be developed by the concrete-bedrock interaction throughout the socket depth.

3-11. Engineering Characteristics of Overburden. The bridge foundations are primarily dependent on the physical characteristics of the bedrock rather than the overburden. Therefore, no strength tests such as Unconfined Compression, Triaxial Shear, or Direct Shear tests were performed on the overburden material. However, general overburden characteristics were defined according to the Unified Soil Classification, the Pocket Penetrometer Test which gives an approximate soil shearing strength, and the Standard Penetration Test which gives the penetration resistance and consistency of cohesive soils. This information was recorded on the exploratory boring logs.

PART IV
SPECIAL DESIGN CONSIDERATIONS

The sockets were analyzed for stresses due to design bending moments and design shears, assuming a rock modulus of 125,000 TSF. The results of this analysis indicated the following conclusions:

- a. The maximum lateral pressure on the surrounding rock would be approximately 90 kips. Any local yielding of the rock would result in significantly lower lateral pressure.
- b. Calculated maximum shears vary depending on the rock modulus assumed. Unit shear stresses cannot be calculated because the shear acts on both the concrete and the rock. The maximum unit shear stress occurs at the top of socket and is approximately 20 p.s.i.
- c. There would not be a significant increase in bending moment from that at the top of socket, regardless of local yielding.
- d. Bending moments would be reduced to the level that the socket without reinforcing steel could adequately resist the moment at any point 10 feet or more below the top of socket.
- e. Local yielding of the top of socket would not significantly increase bending moments in the columns. Maximum deflection at the top of socket due to local yielding would be 0.002 feet.
- f. The surrounding rock within the top 10 feet of socket could be somewhat broken, thus permitting localized yielding; however, the average joint-fracture spacing for the top 10 feet increment should be no closer than 1-1/2 inch. The bottom 10 feet of surrounding rock should have minimum of broken rock. The average joint-fracture spacing for the lower 10 feet of socket should be no closer than 6 inches.
- g. If the bottom of the socket would be lowered by less than 10 feet, it would not be necessary to extend the reinforcing steel cage if it could be adequately supported during placement of tremie concrete.

The point of fixity was assumed for design at 1 foot below the top of rock socket for determining the equivalent column length in the longitudinal frame analysis for earthquake forces. It was determined that the top of rock socket elevations could be lowered 5 feet without a significant effect on the bridge design analysis.

The sockets were designed for bearing at the bottom of the socket at 20 TSF. However, significant side friction in the constructed sockets would reduce the end bearing too much less than 20 TSF. Therefore, it was considered that up to 25 percent of the socket bottom did not have to be sound rock, but at least 10 vertical feet of solid rock should be immediately below the bottom of the socket.

If a clay and/or cavity zone occurred continuously around a socket wall with a total thickness greater than 1.0 foot, the design recommendation was that the bottom of the rock socket should be lowered 1.0 foot for each 1.0 foot of the zone's thickness.

If cavities occurred which extend over more than 10 square feet of a socket wall, the design recommendation was that the bottom of the rock socket should be lowered 1.0 foot for each 10.0 square feet of the cavity area.

PART V
EXCAVATION PROCEDURES

5-01. Overburden Excavation. Overburden was excavated to bedrock at the east abutment of Highway 62 and at Pier No. 1 of Highway 62. Otherwise, there was little to no overburden excavation on the other abutments of the bridges, since embankment was placed essentially on the ground surface. However, the ground surface was stripped and scarified as required for foundation preparation. Also, benching was required for any ground surface which sloped greater than 1 vertical to 3 horizontal. Most of the overburden excavation on land was conducted with 977 L loaders, but a backhoe was used for the spread footing excavations at Pier No. 1, Highway 62 and Pier No. 11, Highway 101.

Overburden was excavated at each rock socket location by a crane equipped with a clam shell bucket. The uneven and weathered bedrock surface was loosened by repeatedly dropping a large chisel-pointed chopping bar over the excavation area. Upon removal of the loosened rock with the overburden, the socket bedrock surface was left reasonably level in most cases. The overburden excavation and disposal was kept entirely underwater and near the lake bottom to avoid turbidity problems.

5-02. Rock Excavation. The majority of the rock excavation was by drilling of rock sockets for the 22 piers located in water. The procedure began by stationing a two-holed template barge over the drill site with four steel anchors. Two 10-foot-diameter casings equipped with ripping teeth were then lowered to the lake bottom through the template holes. Each casing was connected to the kelly and turned with the drill rig until the ripping teeth had cut a firm seat into the rock formation. In some cases sand and/or grout were poured on the top of rock to provide a smoother starting surface. Finally, the 8-foot-4-inch drill bit was lowered through the casing and drilling began.

Reverse rotary was the primary method of drilling except at a couple of locations where straight rotary was used. In reverse rotary drilling the cuttings were lifted to the surface by air pressure through an 8-inch pipe in the center of the kelly-drill stem and then were forced through a hose into a disposal barge. The cuttings were lifted in a mixture of about 50-percent air and 50-percent water with a flow of approximately 2,000 gal/min. The disposal barge filtered the drill water through two barriers of Bidum C-42 fabric before releasing it into the bottom of the lake through a 6-foot-diameter pipe. The cuttings were retained in the barge to be emptied at a designated spoil pit on land. However, it was necessary for the depth of water to equal approximately two-thirds of the height of the drill stem for the reverse rotary system to have enough lift pressure to remove the cuttings properly. Therefore, due to shallow water at Pier No. 13 on Highway 62 and Pier No. 1 on Highway 101, the reverse rotary system was converted to straight rotary with air pressure assistance. In straight rotary the drill cuttings rose to the surface with the drill water which flowed upward through the annular space on the outside of the kelly-drill stem. The cuttings and drill water then flowed out of the casing through slots just above the lake surface. Since both of these piers were located within a few feet of dry land, the drill water and cuttings were separated from the open lake by a tarp curtain which was spread from the drill barge to the shore.

The socket drill was designed and constructed by the Steven M. Hain Company, Inc. of Garland, Texas, and was operated on a Manitowoc 4100 crane. The drill bit assembly was 8 feet 4 inches in diameter and consisted of 14 roller-cone, carbide tipped bits arranged in concentric pattern on a circular connecting plate. Several steel plates were added above the drill bits to give a total assembly weight of 120,000 pounds. The bit was designed to operate with a crushing action assisted by water jetting, and it appeared to perform best in hard, brittle material which was characteristic of much of the local dolomite.

The only rock excavation other than drilling was on Highway 62 at the east bridge abutment and at the spread footing foundation of Pier No. 1. These excavations were relatively small and were accomplished with an air percussion hammer operated on a backhoe.

PART VI
PILE INSTALLATIONS

Both vertical and battered piles were installed at all four bridge abutments and at Pier No. 11, Highway 101. All of the piles were HPL2X53 in size and had a maximum bearing per pile of 55 tons. The piles were driven by Massman Construction Company using a Vulcan 50C hammer. Refusal for this hammer was defined by the Contracting Officer as five blows for the last one-quarter inch of driving, or when damage to the top of the piling occurred as judged by the Contracting Officer's representative.

6-01. Piles for East Abutment, Highway 62. The Highway 62 east abutment was primarily founded on bedrock, but four piles were driven in the wingwall foundations. There was a vertical pile and a battered pile for each of the two wingwalls, and the battered piles sloped at 4 inches per foot. The pile tip elevations at the north wingwall were 587.4 for the battered pile and 587.6 for the vertical pile with a penetration of 9.9 feet and 9.1 feet respectively. The pile tip elevations at the south wingwall were 592.1 for the battered pile and 591.3 for the vertical pile with a penetration of 9.1 feet and 9.4 feet respectively.

6-02. Piles for West Abutment, Highway 62. There were 13 vertical piles and 16 battered piles driven in the west abutment of Highway 62. The battered piles had a slope of 4 inches per foot. The pile tip elevations were estimated in the plans to be about 584 for the abutment proper and 588 for the wingwalls; the actual elevations ranged from 583.90 to 592.32. Penetration ranged from 19.10 feet to 31.45 feet for the vertical piles and from 22.1 feet to 34.07 feet for the battered piles.

6-03. Piles for Pier No. 11, Highway 101. There were 20 vertical piles and 20 battered piles driven at Pier No. 11, Highway 101. Each spread footing had 10 vertical piles, 5 piles battered to the north, and 5 piles battered to the south. The battered piles had a slope of 3 inches per foot. The pile tip elevations were estimated in the plans to be at about 515 for the west footing and 529 for the east footing; the actual elevations ranged from 514.7 to 543.9. Penetration ranged from 19.3 feet to 39.4 feet for the vertical piles and from 11.8 feet to 42.6 feet for the battered piles.

6-04. Piles for North Abutment, Highway 101. There were 11 vertical piles and 12 battered piles driven in the north abutment of Highway 101. The battered piles had a slope of 4 inches per foot. The pile tip elevations were estimated in the plans to be from 568 to 578 for the abutment proper, 560 for the west wingwall, and 607 for the east wingwall; the actual elevations ranged from 578.56 to 593.77. Penetration ranged from 19.5 feet to 33.8 feet for the vertical piles and from 21.3 feet to 36.3 feet for the battered piles.

6-05. Piles for South Abutment, Highway 101. There were 4 vertical piles and 3 battered piles driven in the south abutment of Highway 101. A vertical pile and a battered pile were driven at each wingwall, and the other 3 piles were driven in the abutment proper. The battered piles had a slope of 4 inches per foot. The pile tip elevations ranged from 579.35 to 584.60 for

the wingwalls and from 575.85 to 577.45 for the abutment proper. Penetration ranged from 11.9 feet to 19.5 feet for the vertical piles and from 13.0 feet to 20.1 feet for the battered piles.

Bedrock was too high in most places for the piles to be driven to a suitable depth in the south abutment; therefore, 16 additional piles were concreted in drilled holes. These holes were 18 inches in diameter and consisted of 7 vertical holes and 9 battered holes sloping at 30 degrees from vertical. The vertical holes were drilled at least 2.0 feet into sound rock and ranged in depth from 5.1 feet to 12.9 feet. The battered holes extended from an approximate ground elevation of 588 to elevation 577 and encountered sound rock at a depth of 4.7 feet and above. In each hole concrete was poured around a pile and vibrated into place.

PART VII
CHARACTER OF FOUNDATION

The foundation proved to be quite good for both bridges. Most solution cavities encountered were relatively small, fracturing was usually moderate with most of the intense fracturing in restricted zones, and there was no evidence of faulting. There were zones of soft, weathered dolomite and chert in the first five pier foundations of Highway 101, but most of the rock beneath both bridges was a hard, blocky to massive dolomite that was easily drilled. Although the contract bidding schedule for each bridge allowed 50 additional linear feet of rock excavation to replace poor socket conditions, the only such extended excavation was 8 linear feet in the east socket of Pier 1, Highway 101. Rock socket drilling logs are included in Appendix B of this report.

The following is a summary of the foundation conditions encountered in each rock socket: (Sheets 6 through 52 of the attached drawings are detailed geologic maps of each drilled rock socket.)

7-01. North Socket, Pier 2, Highway 62 (elev. 482.27 to 503.30). The rock surface was relatively smooth with no cavities. There were a few blocky areas, but the rock was mostly massive. Vertical fractures were most prominent in the lower portion of the socket, and horizontal fractures were more prevalent in the upper portion. The drilled rock was moderately hard to hard dolomite with a trace of shale and clay. There was a 4.5-foot-thick bed of quartzitic sandstone or orthoquartzite at elevation 489.10.

7-02. South Socket, Pier 2, Highway 62 (elev. 482.56 to 503.30). The rock surface was relatively smooth but somewhat more fractured than the adjacent north socket. Nearly vertical to diagonal fractures were prominent in the lower three-fourths of the socket. Horizontal fractures were prevalent in three zones which occurred in the lower, middle, and upper socket. There were no major cavities but some occasional vugs. The drilled rock was moderately hard to hard dolomite with traces of shale and chert. There was a 3.9-foot-thick quartzitic sandstone bed at elevation 488.37.

7-03. North Socket, Pier 3, Highway 62 (elev. 451.00 to 471.00). This socket had a noticeable cavity which was apparently derived by the solution weathering of a vertical joint. The cavity covered approximately 6.0 square feet of socket surface area between elevations 463 and 471. However, it was not large enough to require any remedial action. There were also a few smaller cavities and vugs. There was a prominent 11-foot-long horizontal ledge at elevation 468.3 which may have been part of a cavity floor. The rock was broken to blocky near the rock ledge, but otherwise blocky to massive. The predominant fracturing was nearly vertical throughout the socket. The drilled rock was moderately hard to hard dolomite with occasional chert and a trace of green mudstone.

7-04. South Socket, Pier 3, Highway 62 (elev. 451.00 to 471.00). The rock surface was blocky to massive and relatively smooth with a few small cavities and vugs. Most fractures were nearly vertical, but three closely spaced horizontal fractures were conspicuous in the eastern half of the socket

at about elevation 466. The drilled rock was moderately hard to hard dolomite with a 1.4-foot-thick bed of quartzitic sandstone at elevation 456.9 and an 0.2-foot-thick layer of claystone at elevation 458.6.

7-05. North Socket, Pier 4, Highway 62 (elev. 426.85 to 448.00). There was a zone of cavities near elevation 439 and another near elevation 448. However, many of the cavities were shallow, and none occupied over a few square feet of the socket wall. The area between these cavity zones contained occasional vugs and small cavities. Otherwise, the rock surface was relatively smooth. There were a number of minor diagonal fractures, but the most prominent fracturing was horizontal, especially below elevation 437. The drilled rock was moderately hard to hard dolomite with traces of shale, some clay in cavities, a 1.2-foot-thick seam of chert at elevation 441.59, occasional chert nodules, and a 1.6-foot-thick bed of quartzitic sandstone at elevation 442.79.

7-06. South Socket, Pier 4, Highway 62 (elev. 426.87 to 448.00). The rock surface of this socket was very similar to that of the adjacent north socket. There were two cavity zones, one near elevation 442 and another near elevation 448 with a few vugs and small cavities scattered among and between the two zones. Many of the cavities were only shallow recesses, and none occupied over a few square feet of the socket wall. However, some of the cavities at the 448 elevation were deep and extended considerably above the top of socket. There was no need to drill the socket deeper, but the inner concrete forms had to be set at about elevation 447 to avoid the cavities at the top of socket. The rock surface between the two cavity zones was somewhat blocky. Below elevation 439 the rock surface was relatively smooth, there were no cavities, and horizontal fracturing appeared particularly prominent. The drilled rock was moderately hard to hard dolomite with traces of shale and chert, an 0.5-foot quartzitic sandstone bed at elevation 444.21, and a 2.4-foot quartzitic sandstone bed at elevation 441.24.

7-07. North Socket, Pier 5, Highway 62 (elev. 406.75 to 427.30). The rock surface was generally smooth and massive for the most part. There were a few vugs but no large cavities. Horizontal fractures and numerous small irregular fractures occurred intermittently throughout the socket. The drilled rock consisted of moderately hard to hard dolomite with occasional shale and traces of siltstone and chert.

7-08. South Socket, Pier 5, Highway 62 (elev. 406.91 to 427.30). The rock surface was relatively smooth and varied from massive to blocky. There was a zone of small shallow cavities along a horizontal joint at elevation 419.20. Horizontal fractures and numerous small irregular fractures were prevalent throughout the socket. The drilled rock was moderately hard to hard dolomite with a few thin sandstone and shale layers.

7-09. North Socket, Pier 6, Highway 62 (elev. 408.75 to 429.00). The rock surface was generally smooth except for a vuggy zone with intermittent small shallow cavities between elevations 415 and 419. Diagonal to vertical fractures were most numerous below elevation 418, but horizontal fractures were prominent throughout the socket. The drilled rock was moderately hard to hard dolomite with a few chert nodules and occasional thin layers of shale. Some clay occurred in small cavities.

7-10. South Socket, Pier 6, Highway 62 (elev. 408.10 to 429.00). This socket was very similar to the adjacent north socket. The rock surface was generally smooth except for a vuggy zone with intermittent small shallow cavities between elevations 416 and 418.50. Diagonal to vertical fractures were most numerous below elevation 417, but horizontal fractures were prominent throughout the socket. The drilled rock was moderately hard to hard dolomite with some chert and occasional thin shale layers. Some clay occurred in small cavities.

7-11. North Socket, Pier 7, Highway 62 (elev. 409.52 to 428.90). The rock surface was generally smooth, but there were several cavities scattered throughout the socket with the largest covering an area of about 2 square feet. There were two zones of horizontal fractures, one between elevations 415.5 and 418.5 and another above 428.6. Otherwise, the fractures were generally small and irregular ranging from diagonal to vertical. The drilled rock was moderately hard dolomite with occasional chert nodules. There was some clay in a few of the cavities.

7-12. South Socket, Pier 7, Highway 62 (elev. 408.79 to 428.90). The rock surface was smooth and massive for the most part. A couple of shallow recesses occurred between elevations 428 and 430. There were occasional small diagonal to vertical fractures, but the most prominent fractures were horizontal. The drilled rock was moderately hard dolomite with some chert and traces of shale.

7-13. North Socket, Pier 8, Highway 62 (elev. 405.53 to 426.80). The rock surface was generally smooth. There were no cavities. Horizontal fractures occurred intermittently throughout the socket, and there were a few small diagonal to vertical fractures between elevations 412 and 420. The drilled rock was moderately hard to hard dolomite with occasional thin shale seams.

7-14. South Socket, Pier 8, Highway 62 (elev. 405.66 to 426.80). The rock surface was generally smooth. There were no cavities, but a few vugs occurred below elevation 407. There were occasional small diagonal to vertical fractures, but horizontal fractures were predominant throughout the socket. The drilled rock was moderately hard to hard dolomite with a few thin shale seams and traces of chert.

7-15. North Socket, Pier 9, Highway 62 (elev. 403.00 to 424.20). There was a zone of cavities in this socket between elevations 412 and 414.5. The cavities appeared deep in places and the largest covered a surface area of about 17 square feet. Since there was a 1.2-foot overdrill in the socket depth, there was no need to deepen the socket due to the cavity. Otherwise, the rock surface was relatively smooth. The most prominent fractures were horizontal, but diagonal to vertical fractures were scattered throughout the socket. A zone of diagonal fractures occurred just below the cavities between elevations 408 and 412. The drilled rock was moderately hard to hard dolomite with occasional thin shale seams and chert nodules.

7-16. South Socket, Pier 9, Highway 62 (elev. 403.04 to 424.20). A zone of cavities also occurred in this socket, but they were at a slightly lower elevation than in the adjacent north socket. The cavity zone was between elevations 408 and 412. These cavities appeared deep in places, but the largest, which covered a surface area of about 15 square feet, was shallow for the most part. The large cavity was too shallow to require drilling the socket deeper; however, there was a 1.16-foot overdrill in the socket depth. The rock surface was otherwise blocky to massive. There were numerous diagonal fractures throughout the socket, but they were especially prevalent in the south half. Horizontal fractures were prominent above the cavity zone. The drilled rock consisted of moderately hard to hard dolomite with occasional chert, thin shale seams, and a trace of soft claystone.

7-17. North Socket, Pier 10, Highway 62 (elev. 402.48 to 424.50). There was a zone of shallow cavities between elevations 411 and 412 which correlated with the cavity zones in the Pier 9 sockets. However, the cavities were evidently not continuous between piers since they were relatively shallow at Pier 10. Otherwise, the rock surface was generally smooth and massive for the most part. Horizontal fractures occurred intermittently throughout the socket. There was a zone of prominent diagonal fractures below the cavities to elevation 407. The drilled rock was moderately hard to hard dolomite with occasional thin shale seams.

7-18. South Socket, Pier 10, Highway 62 (elev. 403.36 to 424.50). There was also a zone of shallow cavities in this socket between elevations 411 and 412, but these cavities were generally smaller than those in the adjacent north socket. The rock surface was relatively smooth but somewhat more fractured than the north socket. There was a zone of diagonal fractures below the cavities to about elevation 405, and horizontal fractures were prominent throughout the socket. The drilled rock was mostly a moderately hard to hard dolomite with occasional chert and thin shale seams.

7-19. North Socket, Pier 11, Highway 62 (elev. 404.77 to 426.00). There was a zone of small shallow cavities and vugs between elevations 414 and 416. Otherwise, the rock surface was relatively smooth with horizontal fractures prevalent throughout most of the socket. There was a zone of diagonal fractures below the cavities to about elevation 407. Although at a slightly higher elevation, this zone of cavities and the underlying diagonal fractures correlated with similar zones in Piers 9 and 10. The drilled rock was moderately hard to hard dolomite with occasional chert and thin layers of shale.

7-20. South Socket, Pier 11, Highway 62 (elev. 404.90 to 426.00). There was a zone of numerous vugs with a few small shallow cavities between elevations 414.5 and 418. This zone was similar to the cavity zone in the adjacent north socket, but it was more vuggy. The rock surface was otherwise relatively smooth although it was frequently fractured. Diagonal fractures were prominent beneath the cavity zone, and horizontal fractures persisted throughout the socket. The drilled rock consisted of moderately hard to hard dolomite with occasional thin shale layers and a trace of siltstone.

7-21. North Socket, Pier 12, Highway 62 (elev. 403.02 to 450.70). The rock surface was generally blocky with several shallow cavities and recesses scattered throughout the socket between elevations 434 and 435. Horizontal fractures were prominent below elevation 434 and above elevation 443. Small diagonal to vertical fractures occurred throughout the socket. The drilled rock was mostly a moderately hard to hard dolomite with traces of siltstone and clay. Quartzitic sandstone occurred between elevations 441.78 and 435.48 interbedded with hard siliceous dolomite.

7-22. South Socket, Pier 12, Highway 62 (elev. 429.71 to 450.70). The rock surface was blocky for the most part except for massive areas in the upper and lower 4 feet of the socket. There were several shallow cavities and recesses scattered through the central part of the socket between elevations 437 and 448. Numerous small irregular fractures occurred in the blocky cavity area, but otherwise, horizontal fractures were prominent. Part of an exploratory core hole was observed in the western wall of the socket. The drilled rock was moderately hard dolomite with interbedded quartzitic sandstone from elevation 443.47 and 438.07.

7-23. North Socket, Pier 13, Highway 62 (elev. 513.70 to 534.70). The rock surface was relatively smooth with no cavities. There were numerous horizontal fractures throughout the socket and a few diagonal to vertical fractures. Part of an exploratory core hole was exposed in the socket's west wall. The drilled rock was moderately hard to hard dolomite with occasional chert, thin layers of shale, and a trace of sandstone.

7-24. South Socket, Pier 13, Highway 62 (elev. 513.70 to 534.70). The rock surface was relatively smooth with no cavities. There were numerous horizontal fractures throughout the socket and occasional diagonal to vertical fractures. The drilled rock was moderately hard to hard dolomite with a trace of chert and shale.

7-25. West Socket, Pier 1, Highway 101 (elev. 497.57 to 517.90). The rock surface was generally smooth for the most part with a few small cavities and shallow recesses below elevation 507. Horizontal fractures occurred intermittently throughout most of the socket, but were particularly prevalent below elevation 501. There were several scattered vertical to diagonal fractures, but they were most prevalent in the upper northeast section of the socket. The drilled rock was moderately hard to hard dolomite with occasional clay; there was interbedded quartzite from elevation 503.98 to the bottom of the socket.

7-26. East Socket, Pier 1, Highway 101 (elev. 489.62 to 517.90). This socket had a cavity around about 8/9 of the wall of the hole from elevation 503.1 to 510.5. The upper part of the cavity was shallow, but the lower portion was deep and involved about 80 square feet of the socket wall. Therefore, the socket was lowered 8 feet below the designed bottom, allowing 1 foot additional depth for each 10 square feet of the deep cavity area. There was another cavity zone between elevations 499.4 and 502 which amounted to only two shallow recesses about 1 foot thick extending parallel around about two-thirds of the socket wall; these cavities required no remedial action. There was also a shallow recess from elevation 496 to 498.2, and another from about elevation 515 to 518.

Otherwise, the rock surface was mostly blocky with some massive, smooth areas above elevation 512. Horizontal fractures were prominent below elevation 500. There were numerous diagonal to vertical fractures throughout the socket, but they were particularly prominent below elevation 493 and in the northern half of the socket above elevation 511.40. The drilled rock was moderately hard to hard dolomite with clay in cavities and a trace of siltstone or weathered dolomite. There were intermittent, thin quartzitic sandstone beds from elevation 502.63 to 500.53 and from elevation 497.83 to the bottom of the socket.

7-27. West Socket, Pier 2, Highway 101 (elev. 411.68 to 432.00). The rock surface was smooth and massive above elevation 422.5, but it was blocky below that elevation. There were prominent horizontal fractures and numerous small diagonal to vertical fractures in the blocky area. There were no cavities, but several small shallow recesses and vugs. The drilled rock was moderately hard to hard dolomite with occasional chert and thin beds of quartzitic sandstone at elevation 417.60 and 414.00.

7-28. East Socket, Pier 2, Highway 101 (elev. 411.60 to 432.00). The rock surface was generally smooth with only one small shallow cavity at elevation 422. The socket was moderately fractured with a nearly equal amount of horizontal and vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert. There was a quartzitic sandstone bed of 0.5-foot thickness at elevation 418.58.

7-29. West Socket, Pier 3, Highway 101 (elev. 384.46 to 405.00). A vertical joint in the south wall was apparently enlarged by solution into a 3-foot-wide shallow cavity at about elevation 400. Otherwise, the rock surface was blocky to massive and smooth. Fractures were predominantly horizontal to slightly dipped from horizontal with occasional minor vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional areas of soft weathered dolomite and some chert.

7-30. East Socket, Pier 3, Highway 101 (elev. 384.89 to 405.00). The rock surface was blocky with no cavities, but there was a recessed ledge extending around most of the socket at about elevation 404.5. Fractures were predominantly horizontal, but there were also numerous short, diagonal to vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional soft, weathered dolomite, chert, and traces of shale.

7-31. West Socket, Pier 4, Highway 101 (elev. 399.64 to 420.00). There was a prominent, somewhat enlarged vertical joint which crossed through the southwest and northeast quadrants of the socket. The rest of the fractures were mostly horizontal, but several were nearly vertical and relatively short. The rock surface was blocky to massive and smooth, particularly in the southeast quadrant. There were no cavities. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-32. East Socket, Pier 4, Highway 101 (elev. 399.60 to 420.00). There was a cavity which covered about 7 square feet of the socket's southwest wall from elevation 413.3 to 415.8. The rock surface was mostly blocky, although it

somewhat more massive and smooth in the northeast wall. The blocky surface with frequent fracturing was most prominent in the cavity area between elevations 412 and 417. Vertical fracturing was prevalent in the southeast wall. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-33. West Socket, Pier 5, Highway 101 (elev. 396.10 to 430.00). There was a large, deeply recessed area in the bottom portion of this socket from elevation 396.10 to 405.00. Therefore, the top of the rock socket was raised from a planned elevation of 416.00 to 430.00 to compensate for lost surface area in the socket wall. There were other shallow recesses and small cavities throughout the socket, but none of any consequence. The rock surface was blocky for the most part to occasionally broken, and the prominent jointing appeared to dip at about 5 degrees to 30 degrees from horizontal. The drilled rock was moderately hard to hard dolomite with a trace of chert and areas of soft weathered dolomite which appeared somewhat similar to a soft siltstone.

7-34. East Socket, Pier 5, Highway 101 (elev. 395.75 to 430.00). This socket was generally similar to the adjacent west socket, but there were no deep, extensive recesses or cavities. However, the top of socket was raised to elevation 430.00 to match the top of socket elevation for the west socket. There were several shallow recesses and small cavities throughout the socket, but none that would cause any problems. The rock surface was mostly blocky to occasionally broken with frequent fractures of various attitudes. The drilled rock was moderately hard to hard dolomite for the most part with areas of soft weathered dolomite, a 1.5-foot-thick sandstone bed at elevation 408.51 and occasional chert.

7-35. West Socket, Pier 6, Highway 101 (elev. 419.02 to 439.70). The rock surface was relatively smooth with no cavities. Horizontal fractures were predominant throughout the socket with occasional diagonal to vertical fractures. The drilled rock was moderately hard to hard dolomite with some interbedded chert and traces of shale.

7-36. East Socket, Pier 6, Highway 101 (elev. 419.25 to 439.70). There was a large vertical joint which crossed through the southwest and northeast quadrants of the socket. There were sections along the joint enlarged into shallow recesses by solution. Also, a shallow recessed ledge extended around the top of the socket at about elevation 439.60. Otherwise, the rock surface was relatively smooth. Fractures were predominantly horizontal. The diagonal to vertical fractures were most prevalent in the northwest wall. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-37. West Socket, Pier 7, Highway 101 (elev. 430.22 to 450.60). The rock surface was relatively smooth and massive to occasionally blocky. There were no cavities. The predominant fracturing was horizontal with intermittent vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-38. East Socket, Pier 7, Highway 101 (elev. 430.00 to 450.60). The rock surface was generally smooth and massive with no cavities, although there were a few vugs. Fracturing was low to moderate intensity with intermittent horizontal and short, nearly vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-39. West Socket, Pier 8, Highway 101 (elev. 434.40 to 454.50). The rock surface was blocky to massive and smooth with no cavities. Fracturing was relatively moderate in the lower portion of the socket and became more frequent above elevation 448 where the rock became more blocky. The fractures ranged from horizontal to nearly vertical. The drilled rock was moderately hard to hard dolomite with occasional chert and a trace of shale.

7-40. East Socket, Pier 8, Highway 101 (elev. 434.24 to 454.50). The rock surface was relatively smooth except for a shallow cavity or recess around about half of the socket between elevations 452.4 and 455. Fractures were predominantly horizontal below elevation 444 and nearly vertical for the most part above elevation 444. The rock was massive with practically no fracturing below elevation 439. The drilled rock was moderately hard to hard dolomite with occasional chert and traces of shale.

7-41. West Socket, Pier 9, Highway 101 (elev. 434.31 to 455.50). The rock surface was blocky to massive with a vuggy zone between elevations 446.3 and 449.3. There were also a few small cavities and shallow recesses. Fracturing was mostly of slight to moderate intensity, although it was frequent in a few blocky areas and in isolated zones of numerous short, vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert and a trace of shale.

7-42. East Socket, Pier 9, Highway 101 (elev. 434.41 to 455.50). The rock surface was blocky to massive and smooth. There were several small cavities, shallow recesses, and vuggy zones. Fracturing was frequent in occasional blocky areas and otherwise slight to moderate. There were also a few zones of numerous short, vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-43. West Socket, Pier 10, Highway 101 (elev. 462.15 to 482.70). The rock surface was relatively smooth except for several shallow recesses. The recesses occurred mostly along vertical joints in the northeast and southwest socket wall. Other than these joints, the fracturing was mostly horizontal throughout the socket. The drilled rock was moderately hard to hard dolomite with occasional chert and traces of shale.

7-44. East Socket, Pier 10, Highway 101 (elev. 462.75 to 482.70). The rock surface was relatively smooth with no cavities. Horizontal fractures were prominent throughout the socket with occasional nearly vertical to irregular fractures. There was a zone of short, nearly vertical fractures between elevations 470.6 and 472. The drilled rock was moderately hard to hard dolomite with traces of shale and chert. There was a small amount of soft, weathered dolomite at elevation 474.62.

PART VIII
CONSTRUCTION MATERIALS

The earth materials used in the bridge construction consisted of riprap, filter coarse stone, rock fill, concrete aggregate, and fine blend sand, which were supplied to the contractor by Guy King and Sons of Mountain Home, Arkansas. The riprap, filter coarse stone, and rock fill were dolomite obtained from Lee's Mountain Quarry, which is located in Marion County, about 2 miles west of Flippin, Arkansas. This quarry supplied the stone used in the construction of Bull Shoals Dam. The concrete aggregate was fluvial gravel obtained from areas leased on Crooked Creek between the towns of Flippin and Yellville, Arkansas. The fine blend sand was obtained from Silica Products Company, Inc. of Guion, Arkansas. Samples of these materials were tested by the Southwestern Division Laboratory in Dallas, Texas, and were approved for use in the bridge construction.

PART IX
FOUNDATION PROBLEM AREAS

The foundation for both of the highway bridges proved to be quite competent, and no future problems are anticipated. The formation rock was generally sound with relatively few cavities. The one large cavity encountered in the east socket of Pier 1, Highway 101 required deepening of the socket 8 additional feet in accordance to design criteria. The cavity was backfilled with concrete to stabilize the foundation and also provide additional pier support. Although a few zones of soft, weathered dolomite were encountered, particularly at Pier 5, Highway 101, they were overcompensated by the overall soundness of the surrounding rock, and by raising the top of socket an additional 14 feet into the rock above the original planned socket. There were no major deficiencies noted in any of the other rock sockets. There were no serious problems in the foundation of either bridge and, therefore, no significant variances or modifications to design criteria were required because of foundation conditions.

PART X
FOUNDATION INSPECTION AND APPROVAL

10-01. Inspection Equipment. The underwater inspections of rock sockets and core holes were accomplished with equipment supplied by Hydro Products, a Tetra Tech Company with offices in Houston, Texas and San Diego, California. The principal equipment consisted of a Model TC-125 Miniature Underwater Television Camera, a Model LT-7 Underwater Thallium Iodide Light Assembly, a Model SC-303 Television System Control Unit with pan and tilt option, a Model SLD-320 Sony Betamax Videocassette Recorder, a Model RP-5 Underwater Pan and Tilt Unit, Cable Model C101-P, and a Borehole Camera Light Mounting Bracket.

The required equipment was mounted on a steel platform which was set over the 10-foot-diameter casing for each socket inspection. The underwater television camera was contained in an open, steel-frame cage which was suspended beneath the platform by winch cables. A measuring tape was attached to the electrical television cable so that the depth or vertical positioning of the camera could be controlled. The camera cage was suspended from a wheeled table on the inspection platform which could be rotated 360 degrees around a hole in the floor of the platform; this provided the horizontal positioning of the camera. Therefore, the position of the camera could be effectively controlled, and the pan and tilt mechanism allowed the camera to scan the socket wall at any location.

10-02. Rock Socket Inspection. The procedure for the rock socket inspections was to first clean the socket by airlifting and then to map the socket while lifting the television camera through a series of revolutions. Debris and turbid water were airlifted from the socket through an 8- to 12-inch pipe while fresh water was usually pumped in from near the lake surface. After airlifting, the inspection platform was set on top of the 10-foot-diameter casing, and a platform elevation was established for a base reference. The television camera and cage were then lowered on two 1/8-inch steel cables using a hand winch to put the camera within 1.5 feet of the bottom of the socket. At this elevation the first tier of the socket wall and the socket floor were inspected as the camera was rotated to positioned stops around the circumference of the socket. Then the camera was raised in succeeding 3-foot intervals in which the rotating process was repeated. The entire socket wall was normally inspected and mapped in 7 such tiers which usually required about 2 to 5 hours.

10-03. Core Hole Inspection. The procedure for the core hole inspections was to first clean the hole by flushing and then to perform the inspection while the television camera with the attached light and mounting bracket were passed through the core hole. Immediately after the core hole was drilled, it was flushed with clean water for 45 to 60 minutes or until the return flow appeared clear. The television camera assembly was then lowered by hand into the core hole through the water-filled 4-inch drill casing. The camera's electrical cable served as its suspension cable. The rock formation was monitored and video taped as the camera was lowered into and withdrawn from the core hole.

10-04. Inspection Dates and Times. The following is a list of the inspection dates and duration times for each socket:

| <u>Socket Location</u> <u>Highway 62</u> | <u>Aproval-Inspection</u> <u>Date</u> | <u>Duration of</u> <u>Inspection</u> | <u>Comments</u> |
|---|--|---|--|
| Pier 2, North | 4 Dec 1980 | 3 hr. 45 min. | recorder problems |
| Pier 2, South | 3 Dec 1980 | 4 hr. 17 min. | equipment problems |
| Pier 3, North | 24 Jul 1980 | 5 hr. 45 min. | equipment and visibility problems |
| Pier 3, South | 23 & 24 Jul 1980 | 8 hr. 5 min | equipment and visibility problems |
| Pier 4, North | 12 Jan 1981 | 4 hr. 37 min. | ----- |
| Pier 4, South | 20 Jan 1981 | 4 hr. 17 min. | recorder problems |
| Pier 5, North | 25 Aug 1980 | 5 hr. 18 min. | ----- |
| Pier 5, South | 26 & 27 Aug 1980 | 6 hr. 20 min. | electrical problems |
| Pier 6, North | 3 & 4 Feb 1981 | 4 hr. 10 min. | electrical problems |
| Pier 6, South | 10 & 12 Feb 1981 | 3 hr. 40 min. | ----- |
| Pier 7, North | 22 Sep 1980 | 4 hr. 19 min. | ----- |
| Pier 7, South | 19 Sep 1980 | 3 hr. 55 min. | ----- |
| Pier 8, North | 27 & 31 Mar 1981 | 3 hr. 11 min. | ----- |
| Pier 8, South | 25 Mar 1981 | 3 hr. 2 min. | ----- |
| Pier 9, North | 18 Nov 1980 | 6 hr. 17 min. | poor visibility; inspected half sockets |
| Pier 9, South | 12 & 13 Nov 1980 | 7 hr. 9 min. | poor visibility; inspected half sockets |
| Pier 10, North | 7 & 8 Apr 1981 | 2 hr. 32 min. | ----- |
| Pier 10, South | 7 Apr 1981 | 3 hr. 10 min. | ----- |
| Pier 11, North | 25 Feb 1981 | 3 hr. 35 min. | ----- |
| Pier 11, South | 24 & 25 Feb 1981 | 5 hr. | visibility and equipment problems |
| Pier 12, North | 27 & 28 Apr 1981 | 3 hr. 33 min. | ----- |
| Pier 12, South | 24 Apr 1981 | 2 hr. 50 min. | ----- |

| <u>Socket Location Highway 62</u> | <u>Approval-Inspection Date</u> | <u>Duration of Inspection</u> | <u>Comments</u> |
|---------------------------------------|-------------------------------------|-----------------------------------|------------------------------------|
| Pier 13, North | 13 Mar 1981 | 2 hr. 57 min. | ----- |
| Pier 13, South | 13 & 14 Mar 1981 | 2 hr. 55 min. | ----- |
| Pier 1, East | 3 & 10 Aug 1981 | 4 hr. 52 min. | 28 ft. socket |
| Pier 1, West | 12 & 13 Aug 1981 | 2 hr. 34 min. | ----- |
| Pier 2, East | 17 Sep 1981 | 2 hr. 5 min. | ----- |
| Pier 2, West | 16 Sep 1981 | 1 hr. 57 min. | ----- |
| Pier 3, East | 21 & 22 Jul 1981 | 3 hr. 42 min. | ----- |
| Pier 3, West | 18 & 19 Jul 1981 | 4 hr. 18 min. | trouble with television monitor |
| Pier 4, East | 29 Aug 1981 | 3 hr. 30 min. | ----- |
| Pier 4, West | 29 & 31 Aug 1981 | 2 hr. 37 min. | ----- |
| Pier 5, East | 15, 16 & 17 Jun 1981 | 11 hr. 33 min. | 34 ft. socket; poor visibility |
| Pier 5, West | 10, 12 & 19 Jun 1981 | 10 hr. 32 min. | 34 ft. socket; poor visibility |
| Pier 6, East | 9 Oct 1981 | 1 hr. 52 min. | ----- |
| Pier 6, West | 10 Oct 1981 | 1 hr. 45 min. | ----- |
| Pier 7, East | 14 Nov 1981 | 1 hr. 59 min. | ----- |
| Pier 7, West | 14 & 16 Nov 1981 | 1 hr. 41 min. | ----- |
| Pier 8, East | 31 Oct 1981 | 1 hr. 45 min. | ----- |
| Pier 8, West | 31 Oct & 2 Nov 1981 | 2 hr. 5 min. | ----- |
| Pier 9, East | 10 Dec 1981 | 3 hr. 15 min. | ----- |
| Pier 9, West | 11 & 12 Dec 1981 | 4 hr. 25 min. | ----- |
| Pier 10, East | 5 Oct 1981 | 1 hr. 55 min. | ----- |
| Pier 10, West | 5 Oct 1981 | 3 hr. 55 min. | visibility problems |

The duration of rock socket inspections usually varied according to performance of equipment and visibility conditions. Less time was required for inspections after August 1981 which was due in part to two changes in equipment. First, a wide angle lense was used on the underwater camera which gave a wider viewing range. Second, the wheeled table on the inspection platform was modified so that it could move the suspended camera toward or away from the socket wall to obtain the maximum visibility. However, regardless of equipment, the best inspection times occurred in sockets where the outer casing had been turned tightly into the top of rock. This allowed an effective airlifting operation to remove turbidity from the water without additional overburden sediment sloughing into the socket from under the casing.

The core holes drilled below the rock sockets were television inspected immediately after they were drilled and usually required only about 20 to 30 minutes after the hole was flushed.

APPENDIX A

PHOTOGRAPHS

Pages 000 thru 024

PHOTOGRAPHS

| <u>Photograph Number</u> | <u>Title</u> |
|------------------------------|---|
| 1 | View southeast at general construction on Piers 3, 5, 7, and 9 for Highway 62. |
| 2 | View east-northeast at general construction on piers for Highway 62. |
| 3 | View west-northwest at completed piers for Highway 62. |
| 4 | View southeast at superstructure erection for Highway 62. |
| 5 | View of 10-foot-diameter outer casing at Pier 3, Highway 62 site. |
| 6 | View of 8-foot-diameter inner casing-concrete forms. |
| 7 | View of drilling barge preparing to set outer casings. |
| 8 | View of cutting teeth on bottom of outer casings. |
| 9 | View at Pier 12, Highway 62, while turning outer casing into rock for the south socket. |
| 10 | View northeast at drilling of north rock socket, Pier 2, Highway 62. |
| 11 | View north at drilling of south rock socket, Pier 6, Highway 62. |
| 12 | View northwest at drilling of north rock socket, Pier 6, Highway 62. |
| 13 | View northeast at drilling of north rock socket, Pier 2, Highway 62. |
| 14 | View north-northwest at drilling of south rock socket, Pier 6, Highway 62. |
| 15 | View of 8-foot-4-inch-diameter drill bit above 10-foot diameter outer casing. |
| 16 | View of roller cones on bottom of drill bit. |
| 17 | View of drill bit above outer casing. Note wooden stabilizers at top of weight plates on the bit. |
| 18 | View of drill bit with wooden stabilizers inside of outer casing. |

PHOTOGRAPHS (con.)

| <u>Photograph Number</u> | <u>Title</u> |
|------------------------------|--|
| 19 | View of carbide-tipped roller cone on rock socket drill bit. |
| 20 | View of carbide-tipped roller cone showing worn areas. |
| 21 | View of drill stem showing damage crack from wear. |
| 22 | View of installation of splice plates to strengthen drill stem joints. |
| 23 | View northeast at drilling of north rock socket, Pier 8, Highway 62. |
| 24 | View of spoil barge while drilling east rock socket, Pier 3, Highway 101. |
| 25 | View of drill water and cuttings discharging into spoil barge. |
| 26 | View of cutting being sampled from spoil barge. |
| 27 | View from left to right of core drill, television inspection, socket drilling, and spoil barge. |
| 28 | View northwest at core drilling 10-foot hole in bottom of south rock socket, Pier 9, Highway 62; airlift pipe in north socket. |
| 29 | View northeast at core drill on north socket and socket drill on south socket of Pier 4, Highway 62. |
| 30 | View northeast at core drill on north socket and socket drill on south socket of Pier 4, Highway 62. |
| 31 | View of Longyear HC-150 core drill on drilling platform over the 10-foot-diameter socket casing. |
| 32 | View northeast at core drilling in north socket, Pier 6, Highway 62. |
| 33 | View northwest at airlifting in south socket and core drilling in north socket of Pier 8, Highway 62. |
| 34 | View west-southwest at television inspection in south socket and airlifting in north socket of Pier 5, Highway 62. |
| 35 | View of television inspection platform with blue underwater camera cage suspended beneath. |

PHOTOGRAPHS (con.)

| <u>Photograph Number</u> | <u>Title</u> |
|------------------------------|--|
| 36 | View of television inspection platform being lowered onto the outer socket casing; core dirll in background. |
| 37 | View of television inspection platform with white television monitor box on the right. |
| 38 | View of geologist drawing a rock socket map from television monitor in the upper left; north socket, Pier 5, Highway 62. |
| 39 | View of television camera with attached light and mounting bracket for core hole inspections. |
| 40 | View of television monitor showing camera's view in a core hole. |
| 41 | View north of chiseling overburden and top of rock at site for Pier 10, Highway 101; Pier 11 and north abutment in background. |
| 42 | View of typical anchor and anchor setting barge. |
| 43 | View southwest at drilling of pile holes on south abutment, Highway 101. |
| 44 | View of rock bit and vertical pile holes on south abutment, Highway 101. |
| 45 | View west at drilling of battered pile holes on south abutment, Highway 101. |
| 46 | View west at concrete placement in pile holes on south abutment, Highway 101. |
| 47 | View north at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite. |
| 48 | View south at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite. |
| 49 | View of spread footing excavation for the south column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite. |
| 50 | View of spread footing excavation for the north column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite. |



View southeast at general construction on Piers 3, 5, 7, and 9 for Highway 62.

21 Oct 80

Portfork Bridges

Photo No. 1



View east-northeast at general construction on piers for Highway 62.

26 Feb 81

Portfork Bridges

Photo No. 2

000

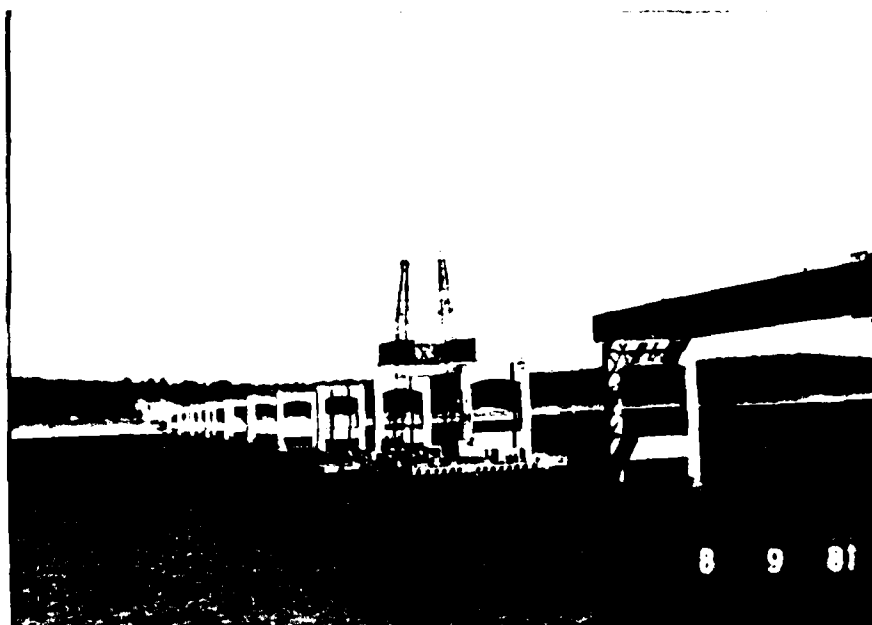


View west-northwest at completed piers for Highway 62.

10 Jun 81

Norfolk Bridges

Photo No. 3

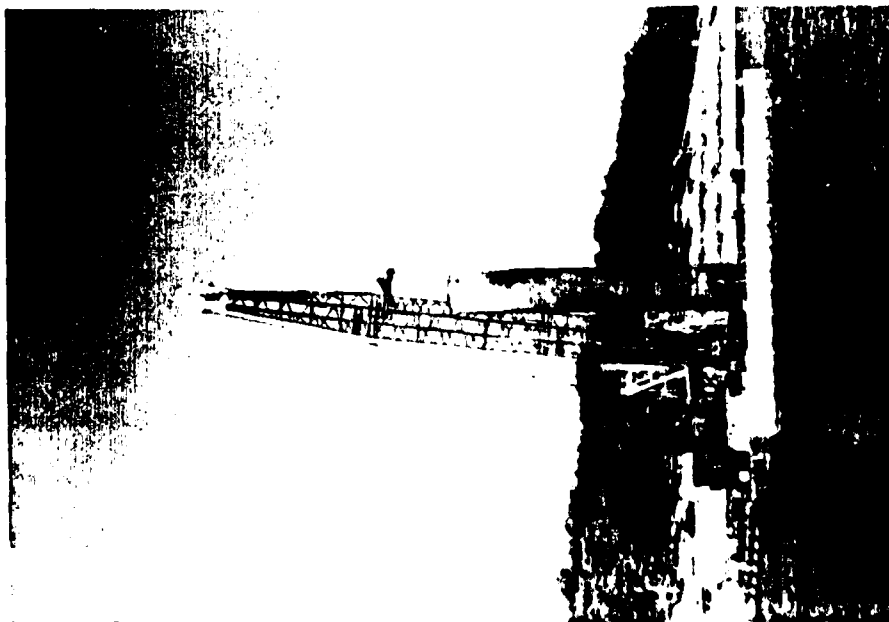


View southeast at superstructure erection for Highway 62.

08 Sep 81

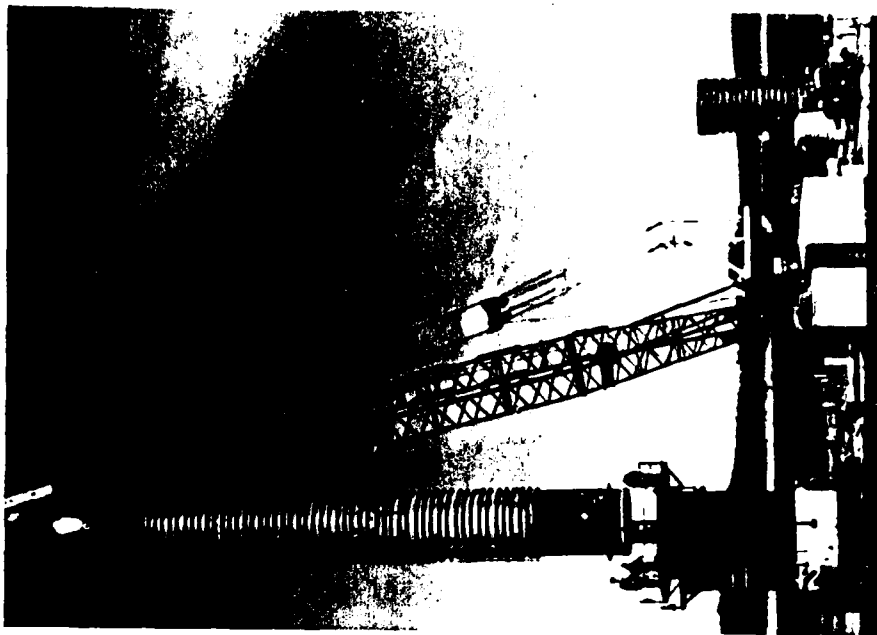
Norfolk Bridges

Photo No. 4



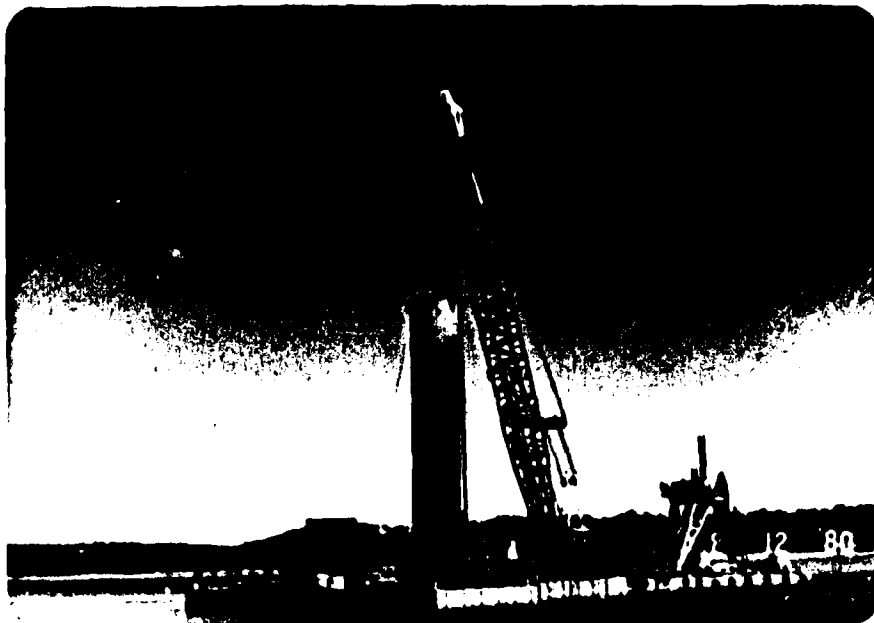
View of 10 ft. dia. inner casing at Pier 3, Highway
62 site.

20 Jan 80 Norfolk Bridges Photo No. 5



View of 8 ft. dia. inner casing - concrete forms.

11 Dec 80 Norfolk Bridges Photo No. 6



View of drilling barge preparing to set outer casings.

12 Dec 50

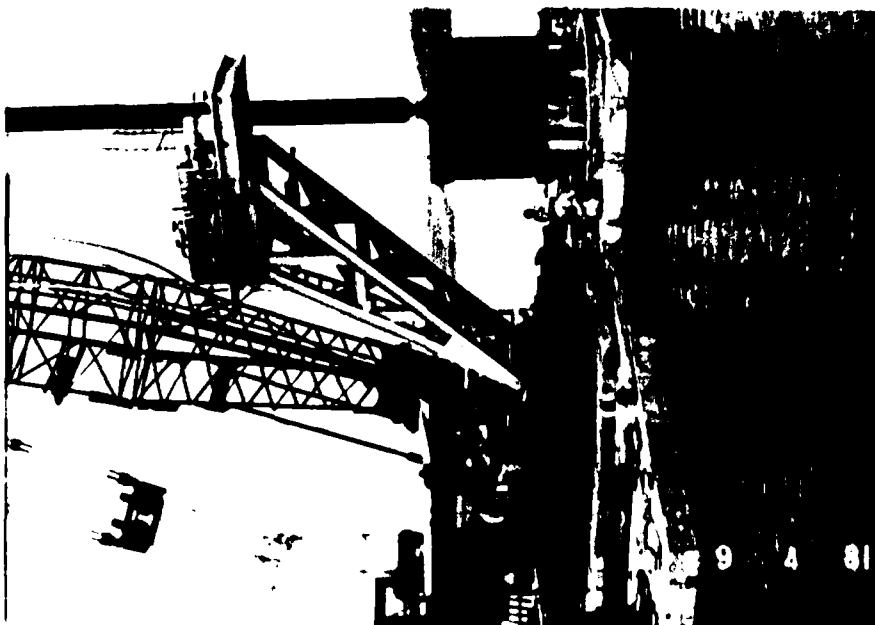
Norfolk Bridges Photo No. 7



View of cutting teeth on bottom of outer casing.

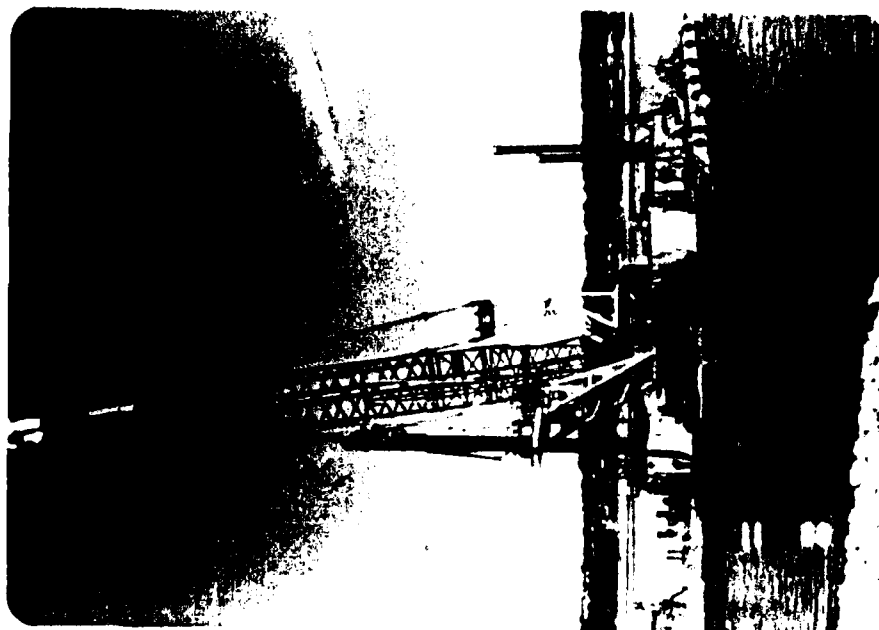
13 Nov 50

Norfolk Bridges Photo No. 8



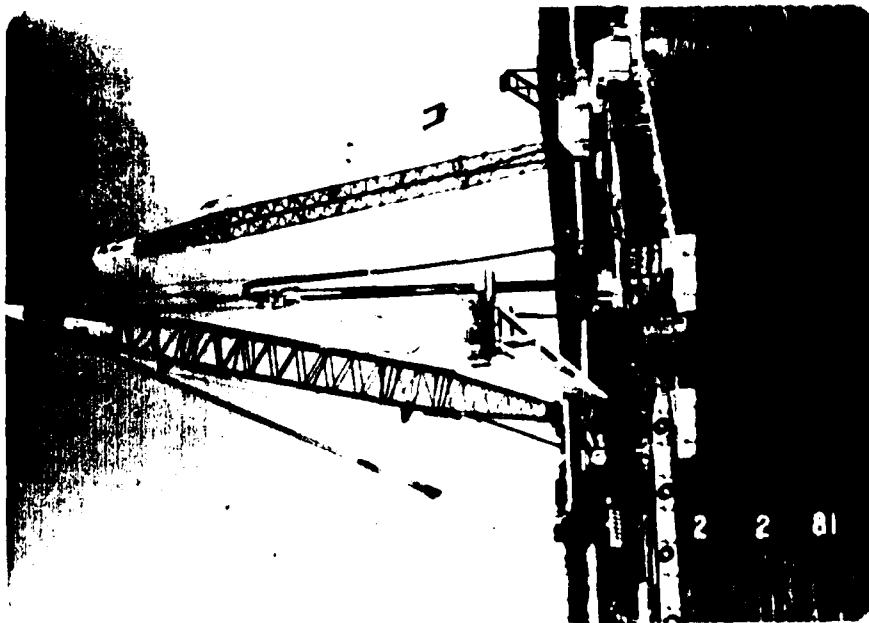
View at Pier 2, Highway 62 while turning water
cabin into rock for the south pier.

20 Apr 62 Norfolk Bridges Photo No. 9



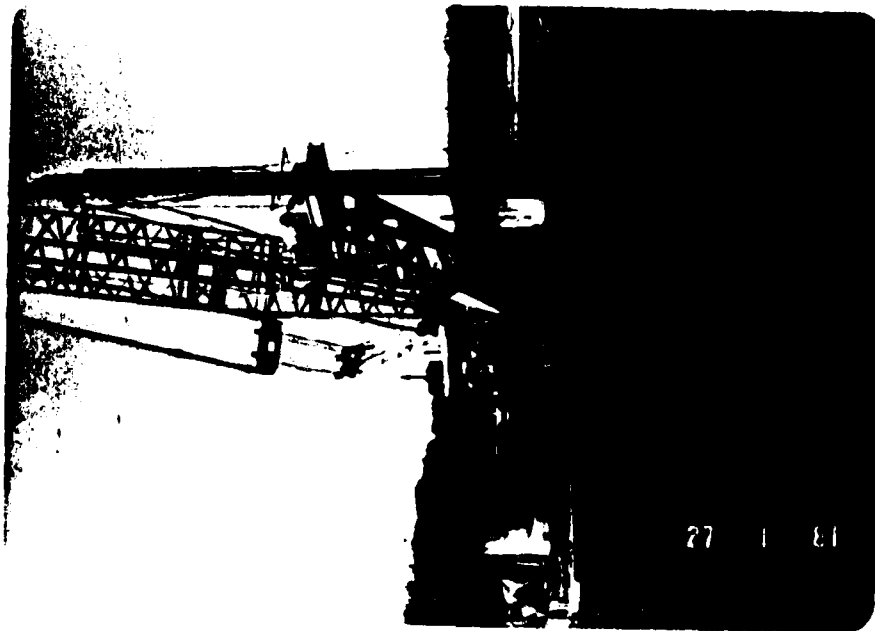
View northeast at drilling of north rock socket,
Pier 2, Highway 62.

21 May 60 Norfolk Bridges Photo No. 10



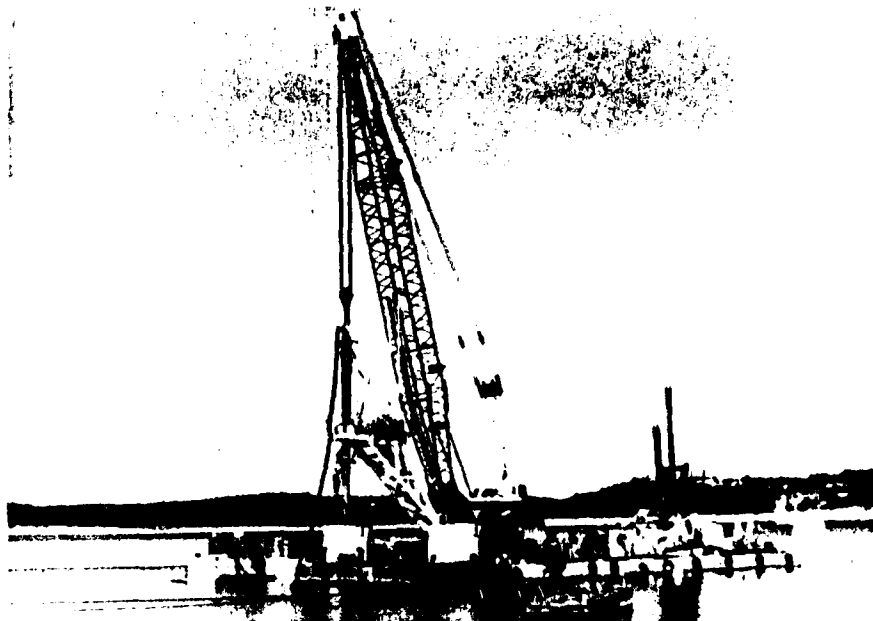
View north at drilling of north rock socket, Pier 6, Highway 62.

27 Feb 81 New York Bridges Photo No. 11



View northeast at drilling of north rock socket, Pier 6, Highway 62.

27 Jan 81 New York Bridges Photo No. 12

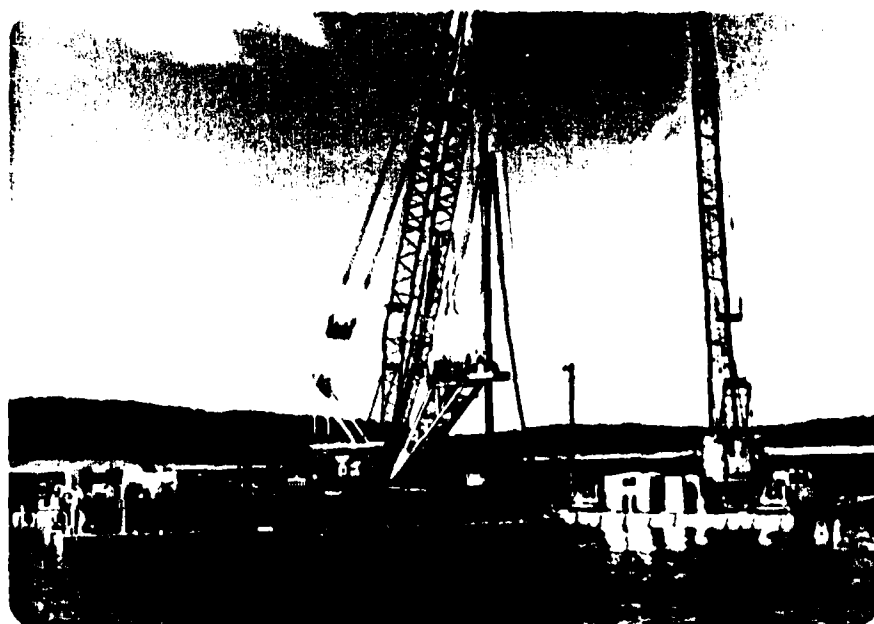


View northeast at drilling of north rock socket,
Pier 2, Highway 62.

20 Nov 60

Norfolk Bridges

Photo No. 13



View north-northeast at drilling of south rock
socket, Pier 6, Highway 62.

20 Nov 60

Norfolk Bridges

Photo No. 14



View of 8 ft. 4 in. dia. drill bit above 10 ft. dia. outer casing.

July 30

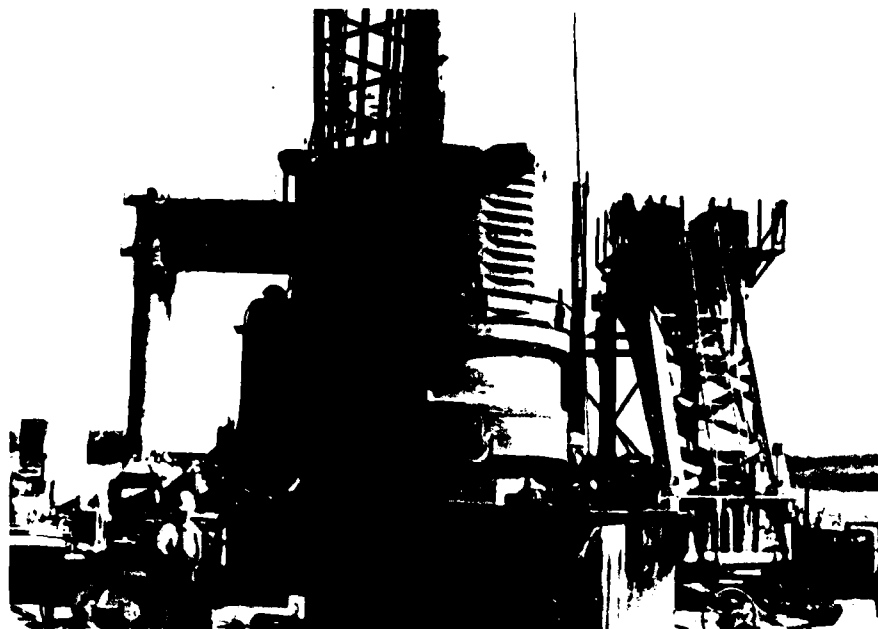
Norfolk Bridges Photo No. 15



View of roller cone on bottom of drill bit.

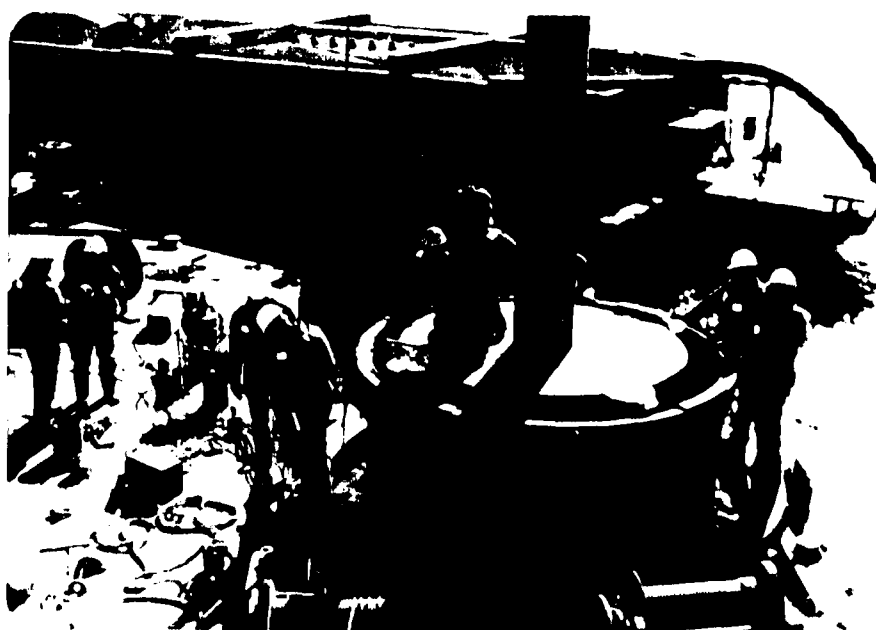
July 30

Norfolk Bridges Photo No. 16



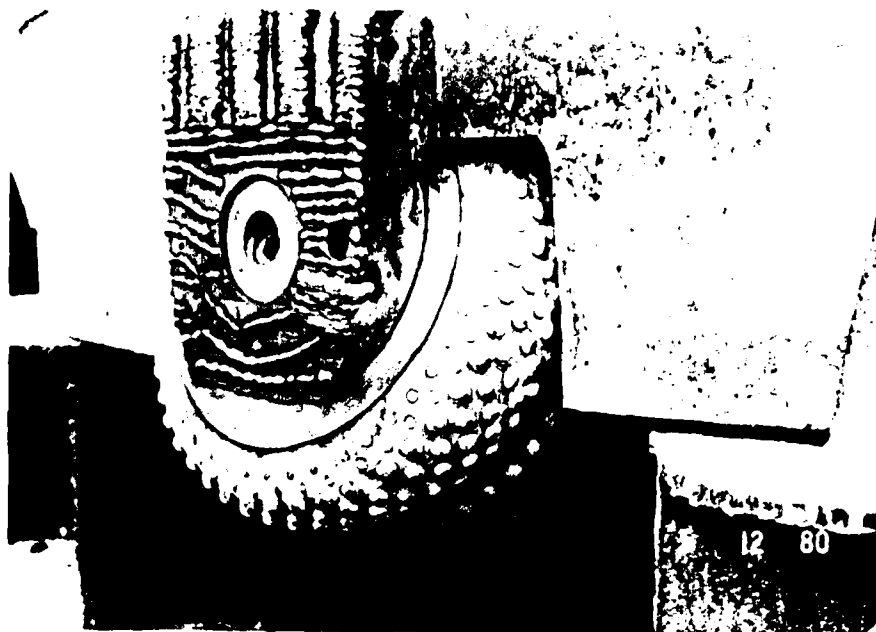
View of drill bit above outer casing. Note wooden stabilizers at top of weight plates on the bit.

13 Jan 61 Norfolk Bridges Photo No. 17



View of drill bit with wooden stabilizers inside of outer casing.

13 Jan 61 Norfolk Bridges Photo No. 18



View of carbide-tipped roller cone on rock socket
drill bit.

05 Dec 80

Norfolk Bridges

Photo No. 19



View of carbide-tipped roller cone showing worn
areas.

07 Jul 81

Norfolk Bridges

Photo No. 20

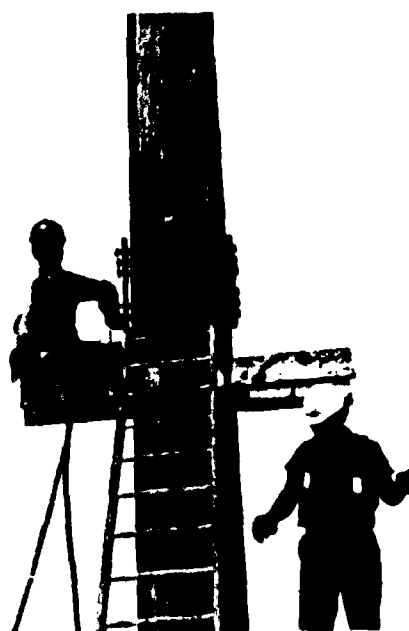


View of drill stem showing damage crack from wear.

29 Oct 81

Norfolk Bridges

Photo No. 21

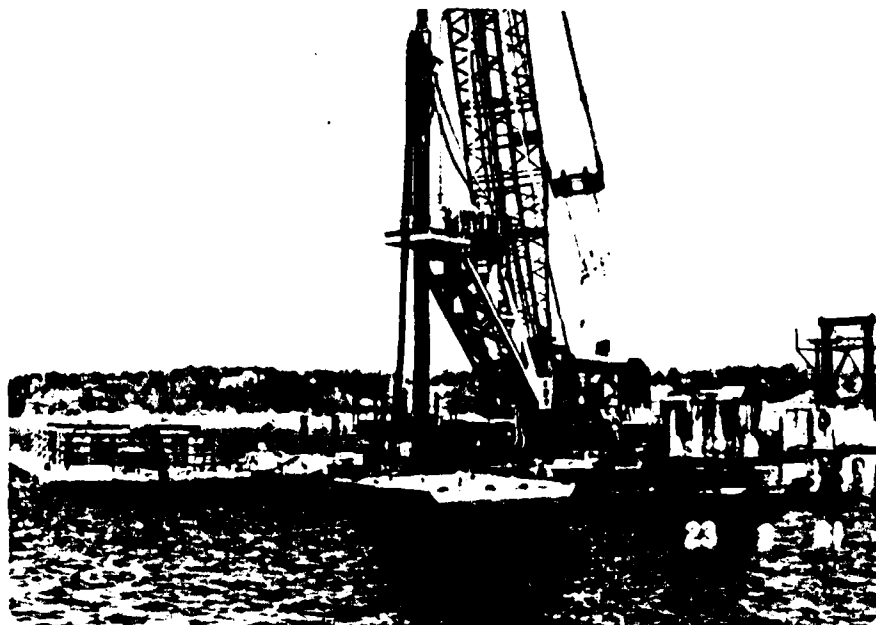


View of installation of splice plates to strengthen drill stem joints.

29 Oct 81

Norfolk Bridges

Photo No. 22

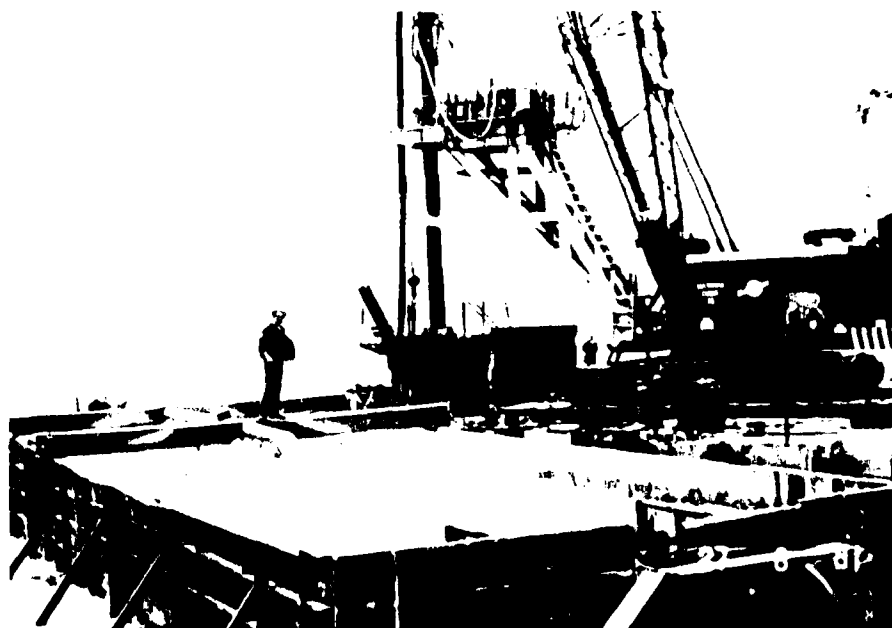


View northeast at drilling of north rock socket,
Pier 8, Highway 67.

23 Mar 81

Norfolk Bridges

Photo No. 23



View of spill large while drilling east rock socket,
Pier 7, Highway 67.

24 Mar 81

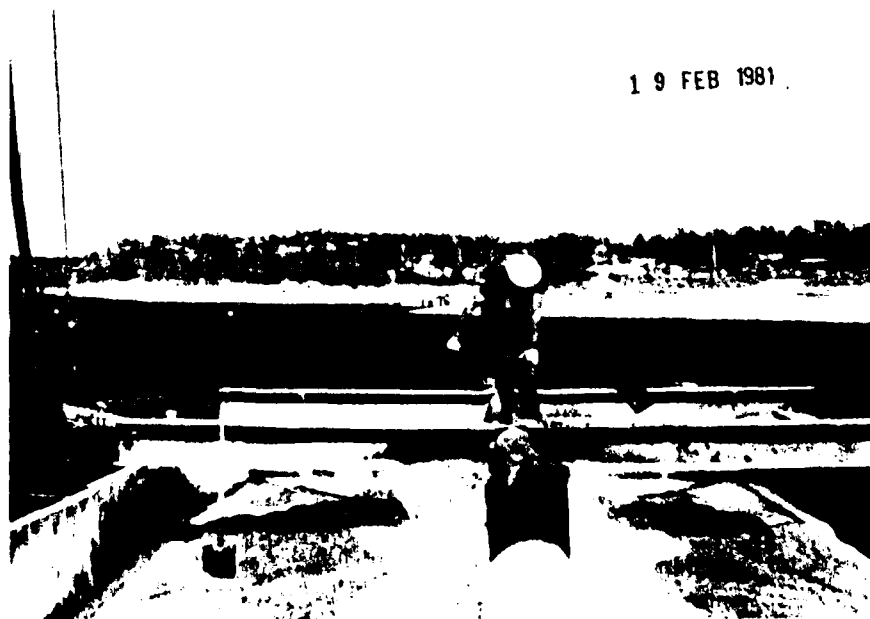
Norfolk Bridges

Photo No. 24



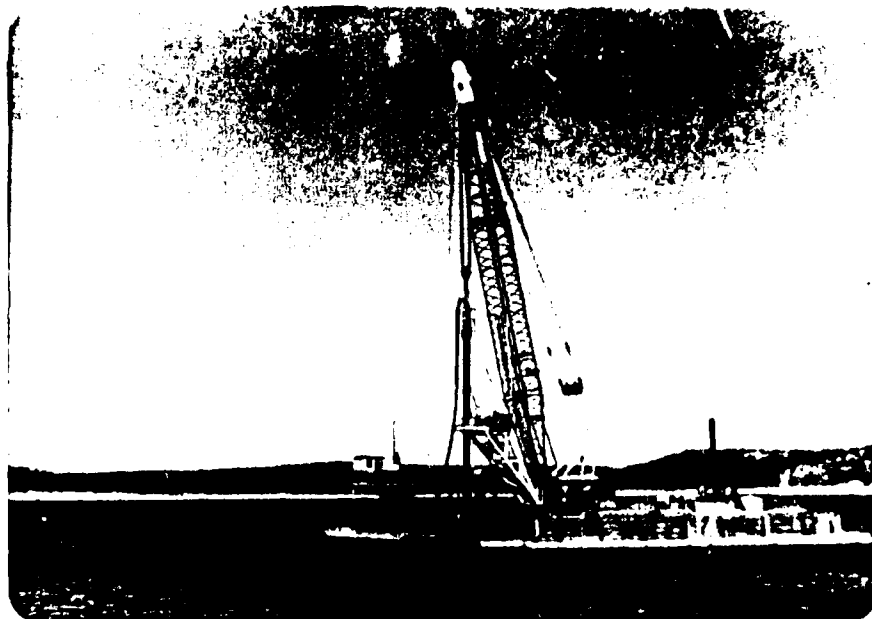
Worker drills water and water is observed in the water pit.

19 FEB 1981



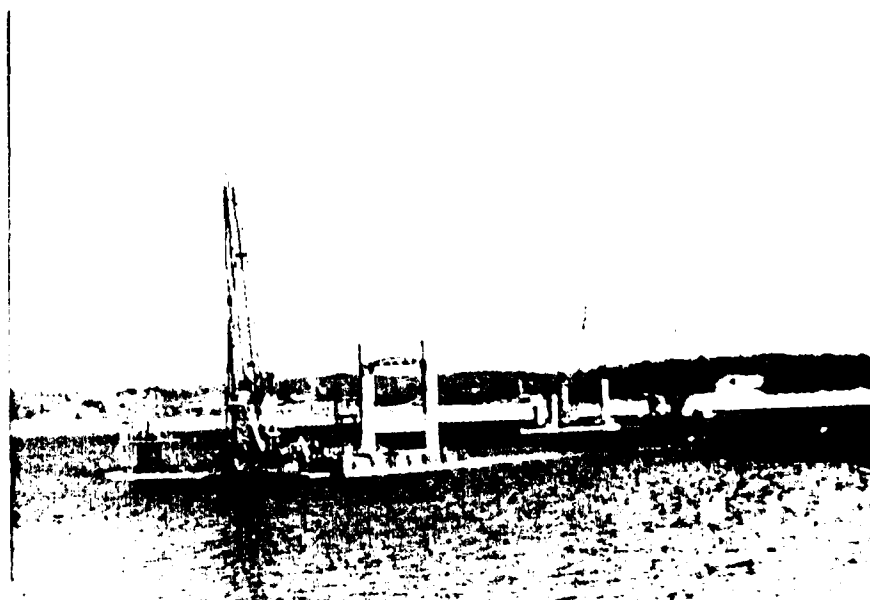
Water is observed in the water pit.

19 FEB 1981



View northeast at core drill on north socket and
 jacket drill on south socket of Pier 4, Highway 62.

14 Jan 81 Norfolk Bridges Photo No. 29



View northeast at core drill on north socket and
 jacket drill on south socket of Pier 4, Highway 62.

14 Jan 81 Norfolk Bridges Photo No. 30

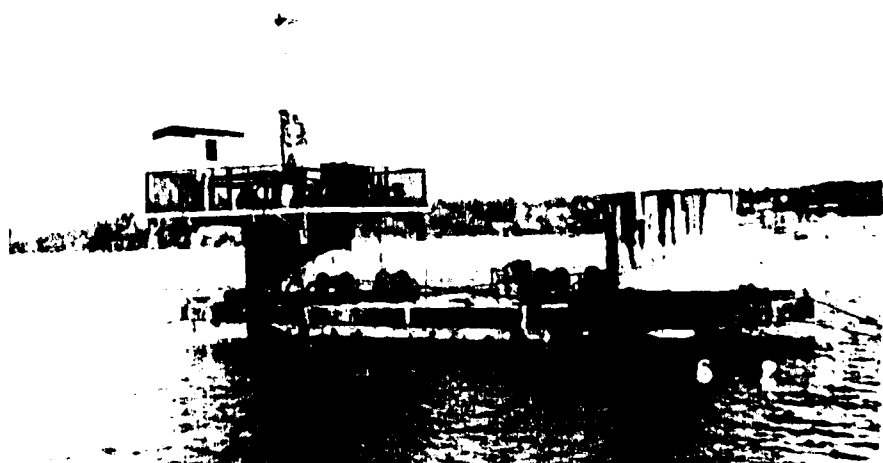


View of Longyear HC-150 core drill on drilling platform over the 10 ft. dia. socket casing.

Sept 80

Norfolk Bridges

Photo No. 31

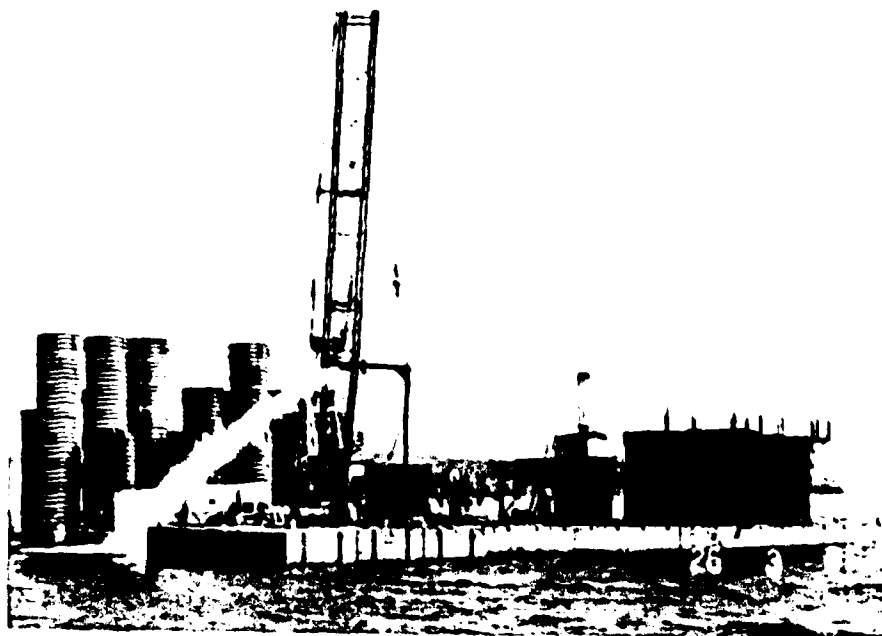


View northeast at core drilling in north socket, Pier 6, Highway 6.

06 Feb 81

Norfolk Bridges

Photo No. 32

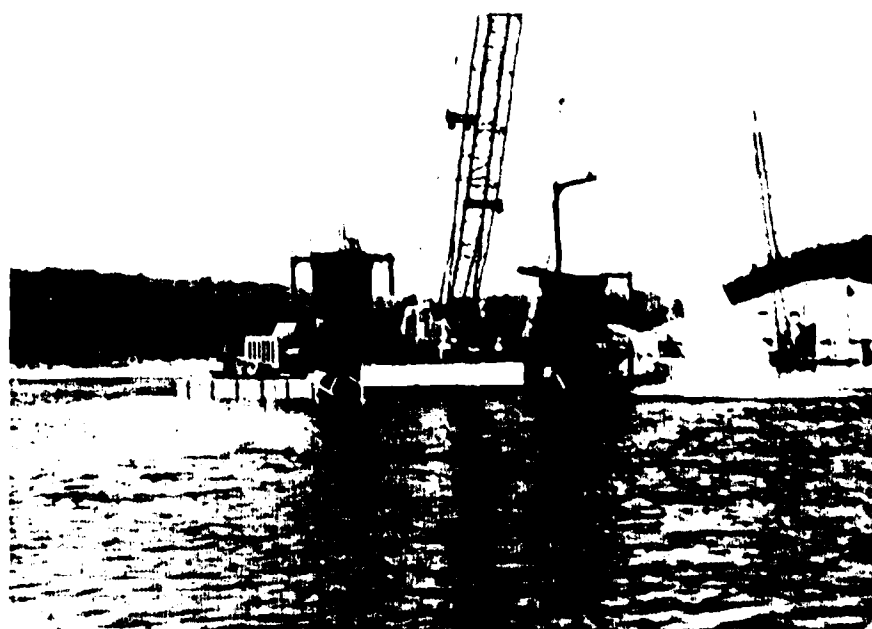


View northwest at airlifting in south socket and
core drilling in north socket of Pier 8, Highway
62.

26 Mar 81

Norfolk Bridges

Photo No. 33

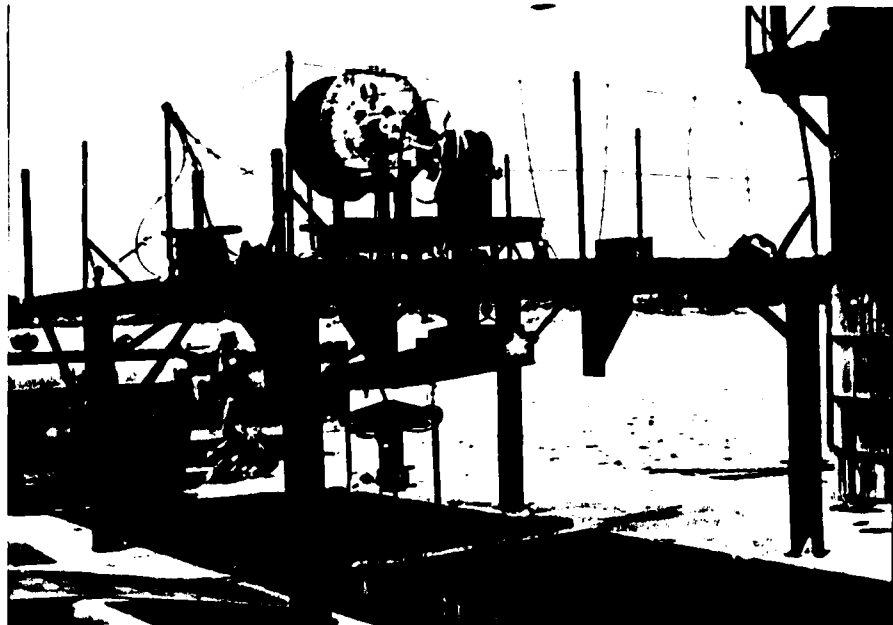


View west-southwest at T.V. inspection in south
socket and airlifting in north socket of Pier 5,
Highway 62.

25 Aug 80

Norfolk Bridges

Photo No. 34

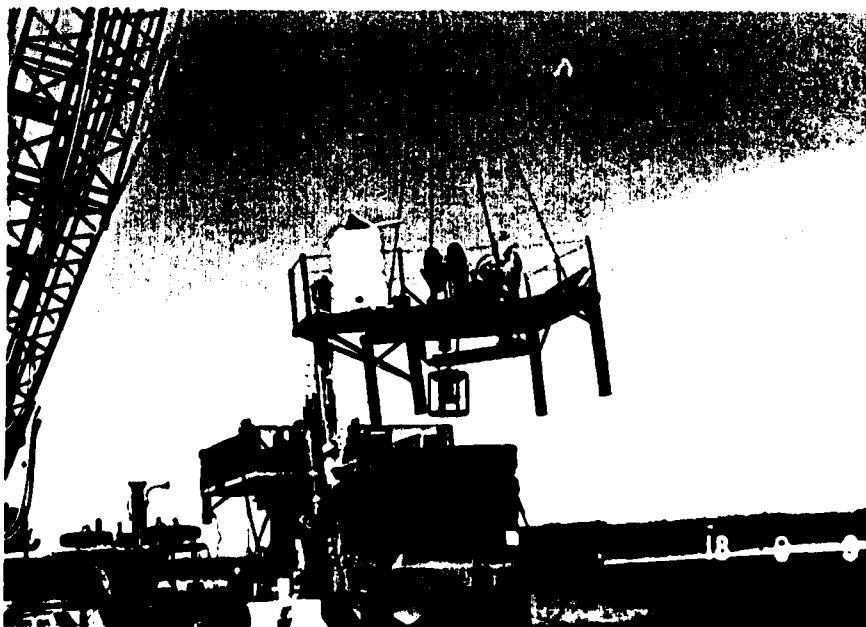


View of T.V. inspection platform with blue under-
water camera cage suspended beneath.

15 Apr 81

Norfolk Bridges

Photo No. 35

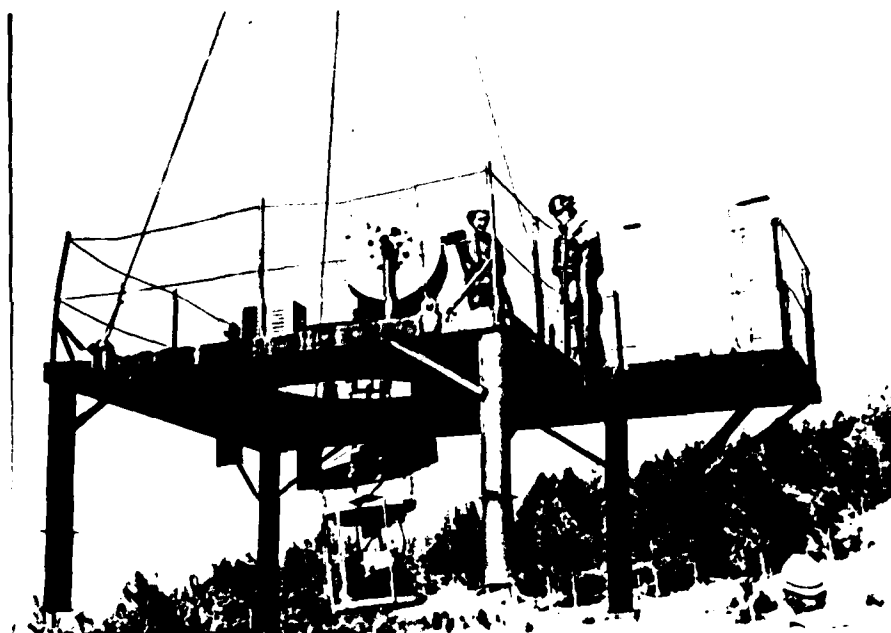


View of T.V. inspection platform being lowered onto
the outer socket casing; core drill in background.

09 Sep 81

Norfolk Bridges

Photo No. 36



View of T.V. inspection platform with white T.V. monitor box on the right.

13 Mar 81

Norfolk Bridges

Photo No. 37



View of geologist looking at rock socket map from T.V. monitor in upper left, north socket, Pier 2, Hickory Is.

13 Mar 81

Norfolk Bridges

Photo No. 38



View of T.V. camera with attached light and mounting bracket for core hole inspection.

July 80

Norfolk Bridges

Photo No. 39



View of T.V. monitor showing camera's view in a core hole.

July 80 Norfolk Bridges Photo No. 40

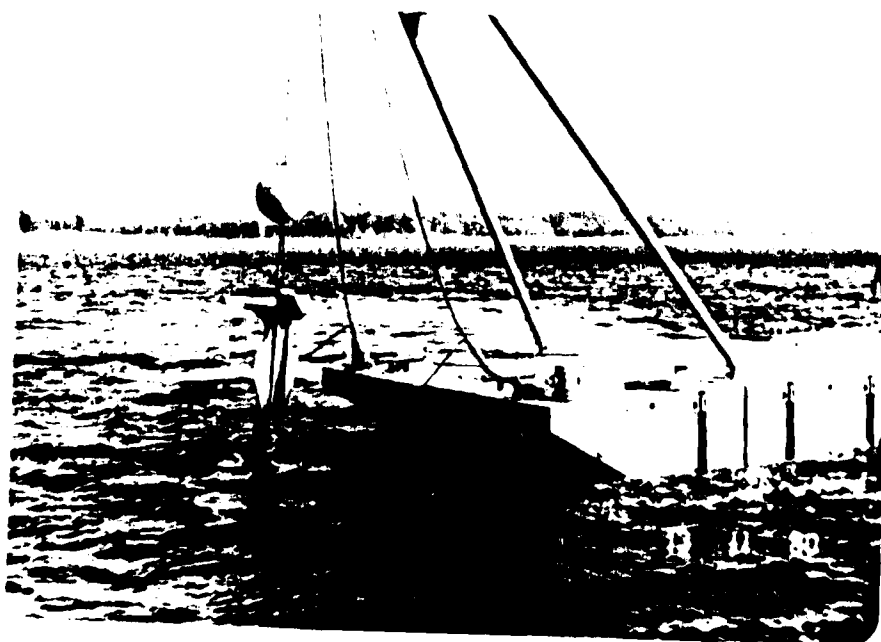


View north of chiseling overburden and top of rock
at site for Pier 10, Highway 101; Pier 11 and north
abutment in background.

02 Jun 81

Norfolk Bridges

Photo No. 41



View of typical anchor and anchor setting barge.

13 Nov 80

Norfolk Bridges

Photo No. 42



View southwest at drilling of pile holes on south abutment. Highway 101.

22 Aug 80

Norfolk Bridges

Photo No. 43



View of rock bit and vertical pile holes on south abutment. Highway 101.

17 Aug 80

Norfolk Bridges

Photo No. 44



View west at drilling of battered pile holes on
south abutment, Highway 101.

05 Sep 80

Norfolk Bridges

Photo No. 45

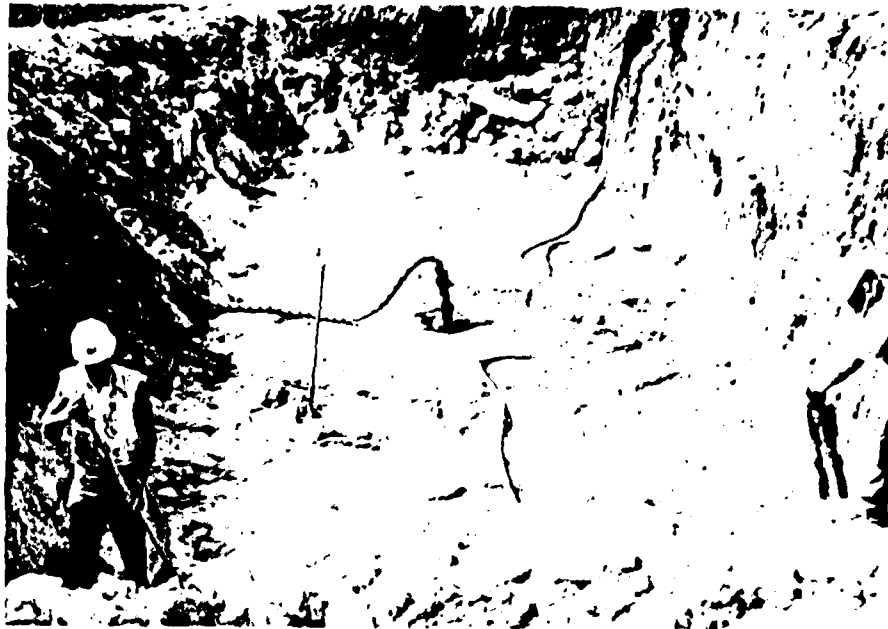


View east at concrete placement in pile holes on
south abutment, Highway 101.

05 Sep 80

Norfolk Bridges

Photo No. 46



View north at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

June 30

Norfolk Bridges

Photo No. 47



View south at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

June 30

Norfolk Bridges

Photo No. 48



View of spread footing excavation for the south column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

May 80

Norfolk Bridges

Photo No. 49



View of spread footing excavation for the north column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

May 80

Norfolk Bridges

Photo no. 50

APPENDIX B

ROCK SOCKET DRILLING LOGS

Pages 025 thru 183

| Boring Log | | Project No. | | Date | | Location | |
|--|-------|-------------------|--|---|-------------|--------------|---|
| Hornfork Lake Bridges | | DACW 03-79-C-1015 | | 11/21/80 | | Smith Rock | |
| 1. Geotechnician | | | | 2. Elevation of Bottom of Hole | | | |
| Robert Schmoker | | | | 552.2 | | | |
| 3. Name of Driller | | | | 12. Manufacturer's Designation of Drill | | | |
| Don Uchtman | | | | Steven M. Hain | | | |
| 4. Direction of Hole | | | | 13. Casing Record | | | |
| <input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Inclined _____ Deg from Vert | | | | Depth 10' C.D. | | | |
| 5. Boring Method: Reverse Rotary | | | | 14. Total Number Core Boxes | | | |
| 6. Depth Drilled into Rock 25.2 | | | | 15. Elevation of Water 540.30 | | | |
| 7. Total Depth of Hole 29.3 | | | | 16. Date Hole Started 11/21/80 Completed 11/24/80 | | | |
| | | | | 17. Elevation Top of Hole 554.05 Platform | | | |
| | | | | 18. Total Core Recovery from Boring 507.4 TOP | | | |
| | | | | 19. Signature of Inspector 510.5 TOG | | | |
| Drill | | | | | | | |
| Elevation | Depth | Drill Rate | Classification of Materials (Description) | Water Loss | Water Color | Water Action | Remarks |
| 510.5 | 1 | 40 Min | Sand | | | | 11/21/80 Start 7:50 |
| | 2 | 40 Min | Cement Grout | | | | 1st No H2O 7rpm 77.42' Stem & DH assembly @ 1' 2nd 13 rpm with H2O 3rd 17rpm @ 2' 4th 27rpm @ 3' Stop 12:55 Add 20' Stem @ 9.7' |
| | 3 | 17 Min | Top of Rock | | | | Start 2:15 4th 27rpm with H2O 97.42' Stem & DH Assy. |
| 507.4 | 4 | 18 Min | Dolomite - Grey - Dark Grey Mod Hard - Hard - Slightly Siliceous | | | | |
| | 5 | 33 Min | @ 4.4 - Clay Seam - Red | | | | |
| | 6 | 27 Min | @ 4.5 - Dolomite - Buff - Grey - Mod Hard - Slightly Fractured | | | | |
| | 7 | 35 Min | @ 6.0 Shale seam - Black - Soft - 6.0 - 6.05 | | | | |
| | 8 | 40 Min | @ 6.05 - Dolomite - Grey - Mod Hard | | | | |
| 503.3 | 9 | 30 Min | @ 6.2 - 6.3 - Shale - Black - Soft | | | | |
| | 10 | 35 Min | @ 6.3 - Dolomite - Buff - Mod Hard | | | | |
| | | | @ 6.7 - Dolomite - Limestone Light Grey - Buff - Soft - Mod Hard | | | | Top of Rock Socket |
| | | | @ 7.6 - Dolomite - Grey - Mod Hard | | | | |
| | | | @ 9.0 - 9.1 - Clay - Red - Soft | | | | |
| | | | @ 9.1 - Dolomite - Buff - Mod Hard | | | | |
| 500.5' | | | | | | | |

025

| DRILLING LOG | | HAWK 03-74-C-0005 | | MILWAUKEE CONSTRUCTION CO. | | SHEET 1 | |
|--|-------|-------------------|--|--|-------------|--------------|---|
| Norfolk Lake Bridges | | | | Elevation of Bottom of Hole | | | |
| 62-P2-N-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 1 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 2 HOLE NO | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 3 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 4 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS 3rd 2 rpm with H2O 97.42' |
| 500.5 | | | | | | | |
| 500.0' | 11 | 1 HR 15 Min | Dolomite - Buff - Mod Hard Massive @ 10.3 - Dolomite - Buff - Grey - Mod Hard - Hard Massive | | | | Stem & DH Assy Stop 3:05 @ 10.5' 11/21/80 |
| | 12 | 45 Min | @ 12.0 - Dolomite - Limestone - Soft - Mod Hard - Massive | | | | 11/22/80 |
| | 13 | 45 Min | @ 12.7 - Dolomite - Buff - Grey - Mod Hard - Massive | MILKY | SMOOTH | | |
| | 14 | 45 Min | | | | | |
| | 15 | 45 Min | | | | | |
| | 16 | 40 Min | @ 15.6 - 15.65 Shale - Black - Soft with Weathered Dolomite Pod - White - Soft | | GREY | ROUGH | |
| | 17 | 40 Min | @ 15.65 - Dolomite - Grey - Mod Hard - Hard - Massive @ 16.2 - Dolomite - Buff - Mod Hard - Slightly Frac w/ Fe stains on Frac Planes | | | | |
| | 18 | 45 Min | @ 17.6 - Dolomite - Grey - Mod Hard - Massive | MILKY | SMOOTH | | |
| | 19 | 45 Min | @ 18.5 - Dolomite - Buff - Mod Hard - Hard - Massive | | | | |
| 490.5 | 20 | 48 Min | | | | | |

026

| DRILLING LOG | | PROJECT | | DATE | | SHEET | |
|-------------------------|--------|----------------|---|-----------------------------|-------------|--------------|------------------------------------|
| Norfolk Lake Bridge | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| Geotechnician | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| HOLE NO. | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| NAME OF DRILLER | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| DIRECTION OF HOLE | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| Boring Method: | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| DEPTH DRILLED INTO ROCK | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| TOTAL DEPTH OF HOLE | | 62-P2-N-Socket | | Elevation of Bottom of Hole | | DI 2 3-11-80 | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 490.5 | 20 | | Dolomite - Buff - Mod Hard - Hard - Massive | | | | 97.42 Stem & D Assembly |
| | 28 Min | | @ 20.5 - Dolomitic Limestone Soft - Mod. Hard - Buff Massive | | | | 3rd 27rpm w/H2 Stop 3:12 |
| 489.2 | 21 | | @ 21.4 - Sandstone - Quartz cemented - Hard - White | | | | 11/22/80 |
| | 39 Min | | @ 22.0 - Dolomite - Buff - Mod Hard | | | | 11/24/80 |
| | 22 | | @ 22.1 - Sandstone - Hard - White - Quartz cemented | | | | Start 7:22 |
| | 45 Min | | @ 24.0 - Sandstone Friable White | | | | 3rd 27rpm w/H20 |
| | 23 | | @ 25.9 - Dolomite - Grey - Mod Hard - Hard - Massive | | | | 97.42' Stem & Down Hole Assy. |
| | 45 Min | | @ 27.0 - 27.1 - Dolomite - Buff - Weathered - Frac | | | | Stop 11:13 |
| | 24 | | @ 27.1 - Dolomite - Buff w/large vugs, filled w/ Calcite crystals - White | | | | |
| | 35 Min | | | | | | |
| | 25 | | | | | | |
| | 26 | | | | | | |
| | 37 Min | | | | | | |
| | 27 | | | | | | |
| | 8 Min | | | | | | |
| 482.2 | 28 | | Bottom of Rock Socket | | | | Design Bottom of Rock Socket 483.3 |
| | 29 | | | | | | Actual Bottom of Rock Socket |

| | | | | | |
|---|--|--|--|--------------------------------------|----------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Massman Construction Co. | |
| Norfolk Lake Bridges | | 102" Smith - Rock | | Elevation of Bottom of Hole 482.4 | |
| 62-P2-S-Socket | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | Steven Hain | |
| Geotechnician Robert Schmoker | | 13 Casing Record | | Depth 46' | Type 10" O.D. |
| HOLE NO. | | 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water 540.45 | |
| NAME OF DRILLER Don Uchman | | 16 DATE HOLE | | STARTED 11/25/80 | COMPLETED 12/1/80 |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 17 ELEVATION TOP OF HOLE | | 553.84 platform | |
| Boring Method: Reverse Rotary | | 18 TOTAL CORE RECOVERY FOR BORING | | 507.3 T.O. Rock | |
| DEPTH DRILLED INTO ROCK 24.9 | | 19 SIGNATURE OF INSPECTOR | | 510.97 T.O. Grout | |
| TOTAL DEPTH OF HOLE 28.47 | | DRILL | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|--|
| | 12 Min | | Sand | | | | 11/25/80 Start 2:38 1st 7rpm w/H2O 77.42' Stem & Down Hole Assy 2nd 17rpm @1.0 Stop @2.0' |
| 508.87 | 15 Min | | Cement | | NUDDY GREY | ROUGH | |
| | 5 Min | | Grout | | | | 11/26/80 Start 7:20 1st 7rpm w/H2O 77.42" Stem & DH Assembly 2nd 17rpm @3.5 3rd 27rpm @4.0 Stop 10:15 Add 20' 97.42' Stem & DH Assy. Start 11:35 4th 27rpm with H2O 97.42' Stem & DH Assy |
| 507.3 | 20 Min | | Top of Rock | | | | |
| | 28 Min | | Dolomite - Buff- Grey - Mod Hard - Slightly Fractured | | | | |
| | 30 Min | | | | | | |
| | 22 Min | | @ 6.7 - 6.75 Shale - Black - soft | | GREY | ROUGH | |
| | | | @ 6.75 Dolomite - Grey - Mod Hard Massive | | | | |
| | | | @ 6.9 - 7.2 Shale - Black - Soft | | | | |
| 503.3 | 28 Min | | @ 7.2 Dolomite - Grey - Mod Hard Massive | | | | Top of Rock Socket |
| | | | @ 7.5 Dolomite - Buff - Soft - Mod Hard - Practured Slightly | | | | |
| | 32 Min | | @ 8.2 Dolomite - Grey - Mod Hard Massive | | | | |
| | | | @ 9.0 Dolomite - Buff - Mod Hard | | | | |
| | 23 Min | | @ 9.8 Dolomite - Buff - Grey - Mod Hard | | | | |

028

| DRILLING LOG | | Project No. DACN 03-79-C-0055 | | Contractor Mastman Construction Co. | | of 2 sheets | |
|--|--------|----------------------------------|---|---|-------------|------------------------------------|--|
| 1. LOCATION Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT | | | |
| 2. LOCATION 62-P2-S-Socket | | | | 11. Elevation of Bottom of Hole | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4. HOLE NO. | | | | 13. Casing Record | | Depth Type | |
| 5. NAME OF DRILLER Don Uchtman | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. ELEVATION of Water | | 16. DATE HOLE | |
| 7. Boring Method: Reverse Rotary | | | | 17. ELEVATION TOP OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | |
| 8. DEPTH DRILLED INTO ROCK 24.0 | | | | 19. SIGNATURE OF INSPECTOR | | | |
| 9. TOTAL DEPTH OF HOLE 27.57 | | | | Drill | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 500.87 | 10 | | | | | | |
| | 37 Min | | Dolomite - Buff - Grey - Mod Hard @ 10.2 - 10.3 Pod of white - soft - weathered dolomite | | | | 97 42' Stem & DH Assy. 4th with H2O 27rpm Stop 3:00 @15.0 |
| | 30 Min | | Dolomite - Buff - Mod Hard slightly frac w/Fe stains @ 11.2 Dolomite - Mod Hard - Hard - Grey - Slightly siliceous | | | | |
| | 1 Hr | | @ 11.8 - 11.9 Chert seam - Brown - Hard @ 11.9 Dolomite - Grey - Hard - Very hard - siliceous w/ Chert nodules | | | | |
| | 35 Min | | @ 12.7 Dolomite - Buff - Grey - Mod hard | | | | |
| | 40 Min | | | | | | |
| 495.87 | 15 | | @ 15.5 Dolomite - Buff - Mod Hard Fractured w/Fe stains on Fractured planes | | | | 12/1/80 Start 7:18 4th 27rpm with H2O 97.42' Stem & Down Hole Assy. |
| | 28 Min | | @ 16.2 Shale seam - Black - Soft @ 16.25 Dolomite - Buff - Grey - Mod Hard - Slightly Frac | | | | |
| | 36 Min | | @ 16.8 Dolomite - Grey - Mod Hard Frac - Fractures shale filled - black - soft | | | | |
| | 33 Min | | @ 17.1 Dolomite - Dark Grey - Mod Hard @ 17.5 Dolomite - Buff - Grey - Hard - Slightly Frac | | | | |
| | 44 Min | | @ 18.8 Dolomite - Buff - Mod Hard Slightly Siliceous | | | | |
| | | | @ 19.4 Dolomite - Buff - Hard w/ Chert (brown) nodules | | | | |
| | | | @ 19.6 Dolomite - Buff - Hard Siliceous | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|--|--|----------------------|--|
| DRILLING LOG | | PROJECT NO. DACN 03-79-C-0055 | | CONTRACTOR Hassman Construction Co. | | OF 2 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 1 LOCATION 62-P2-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 2 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 4 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 STARTED COMPLETED | |
| 7 DEPTH DRILLED INTO ROCK | | | | 18 ELEVATION TOP OF HOLE | | | |
| 8 TOTAL DEPTH OF HOLE | | | | 19 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 20 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|--|------------|-------------|--------------|------------------------------------|
| 490.87 | 20 | | | | | | |
| | 37 Min | | Dolomite - Buff - Hard - Silic | | | | 97.42' Stem & Down Hole Assy |
| | | | @ 20.4 Dolomite - Buff - Mod Hard | | | | 4th 27rpm w/H2O |
| | 21 | | | | | | Stop 1:15 |
| | 36 Min | | @ 21.5 Dolomite - Buff - Mod Hard | | | | Grease Swivel |
| | | | Frac w/Fe stains on Frac planes | | | | Start 1:22 |
| | 22 | | | | | | Rough Drilling |
| | 28 Min | | @ 22.5 Sandstone - silica cemented very fine grained, hard | | | | 25.0- 26.0 |
| | | | | MILKY | SMOOTH | | Possible solution cavities (small) |
| | 23 | | | | | | Stop 2:35 BOH |
| | 52 Min | | | | | | |
| | 24 | | | | | | |
| | 31 Min | | | | | | |
| | 25 | | | | | | |
| | 45 Min | | | | | | |
| | 26 | | | | | | |
| | 18 Min | | @ 26.4 Dolomite - Buff - Mod Hard | | | | |
| | | | Frac | | | | |
| | 27 | | @ 26.6 - 27.0 Small cavern | MILKY | ROUGH | | |
| | | | | | | | Design Bottom of Rock Socket |
| | 28 | 12 Min | | MILKY | SMOOTH | | 483.3 |
| 482.4 | | | Bottom of Rock Socket | | | | Actual Bottom of Rock Socket |

030

10. HMC 00-10-0055
 11. Smith Lake Bridges
 12. P3-N-Socket
 13. Technician Robert Schmoker
 14. H52-P3-N
 15. Driller Don Uchtman
 16. Method: Reverse Rotary
 17. Depth 91
 18. Elevation of Bottom of hole 451.0
 19. Elevation of Water Variable 552.43
 20. Date Mole 6/24/80
 21. Elevation Top of Hole 565.98 Platform
 22. Core Recovery 477.96 Top of Grout

| Drill. Rate | ASSIGNATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-------------|--|------------|----------------|--------------|---|
| 477.96 | CEMENT GROUT | | Cement Color | Smooth | Start 9:48 97.42 Stem and Kelly Full load 1st gear 7rpm w/H2O @10.32 .7 shift to 2nd gear 17rpm Stop 11:15 Start 11:17 in 1st gear 7rpm bit jumping on hard spot Stop 11:34 Hose problem Start 11:40 Stop 12:34 Start 1:05 Stop 1:10 Start 1:30 H2O off @ 7 H2O on @ 7.6 H2O off at 7.8 Bottom of Casing |
| 50 Min | | | | | |
| 26 Min | Dolomite Ledge in grout @ 1' Buff-Soft-Mod Hard | | | | |
| 14 Min | Clay lens w/grout & mod hard Dolomite Ledge Rock | N/A | | | |
| 19 Min | Top of Rock El: 474.3 | | | | |
| 474.3 | Chert @ 4.5 - 4.6 Dolomite-Grey-Buff Mod Hard w/clay spots & grout | | Muddy | Rough | |
| 19 Min | Dolomite very weathered soft-grey | | | | 2:45 8.1 H2O on 2nd gear 20rpm full load Stop 3:07 Tighten stem bolts 8.5 Start 3:43 |
| 8 Min | @5.8 Chert bed .1" thick | | | | |
| 27 Min | @6.4 Dolomite-Grey-Buff-Mod Hard-Clay-Grout | | | | |
| 471.0 | | | | | Top of rock socket |
| 1 HR | @7.6 Dolomite - Mod Hard-Buff-Grey | | Slightly Muddy | | Stop 5:15 34.75 |
| 8 | @8.1 Dolomite-Hard-v hard-Silicious Grey-Dark Grey | | | | |
| 52 Min | | | Milky | Smooth | |
| 9 | Dolomite-Hard-v hard Grey-Slightly Fractured Silicious | | | | |
| 1 HR 37 Min | Dolomite - Slightly fractured @ 9.5' | | | | |
| 10 | | | | | |

| | | | | | | | |
|-------------------------------|--|----------------------------------|--|--|--|-----------|--|
| DRILLING LOG | | Project No. DACH 03-79-C-0055 | | MREESON Construction Co. | | 101 3 | |
| Norfolk Lake Bridges | | | | 10 SITE AND TYPE OF BIT | | | |
| 62-P3-N-Socket | | | | 11 Elev. of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 13 Casing Record | | | | Depth | | Type | |
| 14 TOTAL NUMBER CORE BOXES | | | | 15 ELEVATION OF WATER | | | |
| 16 DATE MOLE | | | | STARTED | | COMPLETED | |
| 17 ELEVATION TOP OF MOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 19 SIGNATURE OF INSPECTOR | | | | | | | |
| Boring Method: Rotary | | | | | | | |
| 20 TOTAL DEPTH OF MOLE | | | | | | | |
| 21 DEPTH PENETRATED INTO ROCK | | | | | | | |
| 22 TOTAL DEPTH OF MOLE | | | | | | | |
| 23 ELEVATION OF WATER | | | | | | | |
| 24 ELEVATION OF WATER | | | | | | | |
| 25 ELEVATION OF WATER | | | | | | | |
| 26 ELEVATION OF WATER | | | | | | | |
| 27 ELEVATION OF WATER | | | | | | | |
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| 92 ELEVATION OF WATER | | | | | | | |
| 93 ELEVATION OF WATER | | | | | | | |
| 94 ELEVATION OF WATER | | | | | | | |
| 95 ELEVATION OF WATER | | | | | | | |
| 96 ELEVATION OF WATER | | | | | | | |
| 97 ELEVATION OF WATER | | | | | | | |
| 98 ELEVATION OF WATER | | | | | | | |
| 99 ELEVATION OF WATER | | | | | | | |
| 100 ELEVATION OF WATER | | | | | | | |

| | | | | | |
|-----------------------------|--|-------------------------------|--|---|--|
| DRILLING LOG | | Project No. DAG 03-79-0005 | | Contractor Hargreaves Construction Co. | |
| Norfolk Lake Bridges | | | | 10. Elev. of Bottom of Hole | |
| 62-P3-N-Socket | | | | 11. MANUFACTURER'S DESIGNATION OF CHILL | |
| Geotechnician | | | | 12. Casing Record Depth Type | |
| 13. TOTAL NUMBER CORE ROLES | | | | 14. ELEVATION OF HOLE | |
| 15. DATE HOLE | | | | 16. DATE HOLE | |
| 17. ELEVATION TOP OF HOLE | | | | 18. RECOVERY OF HOLE | |
| 19. METHOD: Rotary | | | | 20. RECOVERY OF HOLE | |
| 21. RATE OF HOLE | | | | 22. RECOVERY OF HOLE | |

| Depth | Drill Rate | Classification of Material | Water Loss | Water Color | Water Action | Remarks |
|---------------|------------|--|------------|-------------|--------------|---|
| 457.00 - 10' | | | | | | |
| 50 min | | Dolomite - Silicious Hard-V Hard Grey Slightly Fractured | | | | 2nd gear Full load 137.42 Stem and Kelly w/H2O Stop 9:32 Ster Start 9:34 |
| 11 | | @ 10.80-10.85 Dolomite weathered - soft | | | | |
| 44 min | | Dolomite - Buff - Grey Mod Hard-Hard-Fractured | | | | Occasional muddy H2O Prob cave in of overburden |
| 12 | | Chert @ 11.75-11.9-12.0 | | | | |
| 45 min | | .1' weathered Dolomite Seam @ 12.4 soft Fe stained | | | Milky Smooth | |
| 13 | | | | | | |
| 46 min | | Green Mudstone Seam @ 12.5 .05 thick | | | | |
| 14 | | | | | | |
| 1 Hr 5 min | | Dolomite-Grey-Buff Mod-Hard-Hard | | | | |
| 15 | | | | | | |
| 40 min | | @ 15.3-15.35 Dolomite-Soft-Fract. | | | | Stop 1:10 Eng Ck Start 1:20 |
| 16 | | | | | | |
| 45 min | | | | | | |
| 17 | | Dolomite-Grey-Buff Mod Hard-Fractured @ 17.0' w/occasional vugs to 18.6 | | | | |
| 30 min | | | | | | |
| 18 | | | | | | |
| 40 min | | | | | | |
| 19 | | | | | | |
| 40 min | | | | | | |
| 20 | | | | | | |

Title: DACW 03-79-C-0055
 Location: Norfolk Lake Bridges
 Core: 62-P3-S
 Geotechnician: Robert Schmoker
 Core: 62-P3-S
 Name of Driller: Don Uchtman
 Direction of Hole: ☒ Vertical ☐ Inclined DEC FROM VERT
 Boring Method: Reverse Rotary
 Depth Filled Into Rock: 31.8
 Total Depth of Hole: 33.8

10 Size and Type of Bit: 102" Smith-Rock
 11 Elev. of Bottom of Hole: 451.0
 12 Manufacturer's Designation of Drill: Steven M. Hain Co.
 13 Casing Record: 481.81-565.31 Depth: 83.5 Type: 10" dia 1" W
 14 Total Number Core Boxes: N/A
 15 Elev. of Water: Variable 553.02
 16 Date Hole: 6/4/80 Started: 6/20/80
 17 Elevation Top of Hole: 467.05 Platform
 18 Total Core Recovery Footage: 482.8 Top of Rock
 19 Signature of Inspector:

| Elevation | Depth | Drill Rate | Classification of Materials (Description) | Water Loss | Water Color | Drill Action | Remarks |
|-----------|-------|-------------|---|------------|----------------|--------------|---|
| 484.8 | | 27 min | Concrete (Grout) | | | | Depth of H2O to Top of Grout |
| | 1 | 28 min | | | Muddy | Rough | 11:51 Lost Table Engine |
| 482.8 | 2 | | Top of Rock | | | | H ₂ O muddy and sandy until bottom of casing reached |
| | 3 | 1 Hr 41 min | DOLOMITE w/SS SEAMS | | | | Bottom of 10 dia. |
| | 4 | 1 Hr 25 min | S.S. @ 4.1 - .2 Thick | | | | Outer Casing (481.81) |
| | 5 | 50 min | Grey Dolomite | | Slightly Milky | Smooth | 4:25 Stop Bearing Burn out on Table 6/6/80 |
| | 6 | 45 min | Chert | | | | 4:27 11:25 2nd gear 20rpm 11:35 Stop engine problem Start 12:45 Stop 1:51 Bearing check |
| | 7 | 41 min | Cherty-Dolomite | | | | Start 2:02 Stop 2:43 Start 2:48 Stop 3:21 Start 3:35 Stop 5:00 6/7/80 Start 9:15 |
| | 8 | 34 min | Brown Dolomite | | | | |
| | 9 | 44 min | | | | | |
| | | 1 Hr 31 Min | Buff - Grey Dolomite | | | | |

Project: **Norfolk Lake Bridges**

62-P3-S

Geotechnician: **Robert Schmoker**

62-P3-S

NAME OF DRILLER: **Don Uchtman**

DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT

Boring Method: **Reverse Rotary**

DEPTH DRILLED INTO ROCK: **31.8**

TOTAL DEPTH OF HOLE: **33.8**

10 SIZE AND TYPE OF BIT: **102" Smith-Rock**

11 Elev. of Bottom of Hole: **451.0**

12 MANUFACTURER'S DESIGNATION OF DRILL: **Steven M. Bain**

13 Casing Record, Depth, Type: **481.81-565-31 83.5 10" dia 1"**

14 TOTAL NUMBER CORE BOXES: **R/A**

15 Elev. of Water: **Variable**

16 DATE HOLE: **6/4/80**

17 ELEVATION TOP OF HOLE: **467.05 Platform**

18 TOTAL CORE RECOVERY FOR BORING: **482.8 Top of Rock**

19 SIGNATURE OF INSPECTOR: _____

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | Remarks |
|-----------|-------|-------------|--|------------|----------------|--------------|--|
| 474.8 | 10 | 56 Min | Brown-Grey Dolomite Mod Hard | | | Smooth | Stop 11:52 Lunch Start 2:20 Stop 2:58 Block Twist |
| | 11 | 59 Min | | | | | 6/16/80 Start 4:35 @12.14 2nd gear 20rpm Stop 5:10 @ 12.82 |
| | 12 | 1 Hr 11 Min | | | | | 6/17/80 Start 10:33 Stop 1:15 Start 2:00 Stop 4:40 |
| | 13 | 1 Hr 20 Min | | | | | 6/18/80 Start 17.0 1st hour 1st gear 6-7rpm 17.0-17.3 Full weight with H2O |
| 471.0 | 14 | 1 Hr 20 Min | Top of Rock Socket | | | | Start 8:40 17.3 1hr 20min 9:40 11:00 2nd gear 14rpm Stop 11:00 Start 11:10 @18 No H2O 2nd gear 14rpm Full wt Stop 11:25 Start 11:43 12:50 @ 19 H2O Turned off |
| | 15 | 1 Hr 15 Min | | | Slightly Milky | | Stop 1:18 Broken bolt on swivel Start 1:52 @19.5 H2O Back on 14rpm |
| | 16 | 1 Hr 25 Min | DOLOMITE Grey-Mod Hard Hard | | | | |
| | 17 | 2 Hr 20 Min | SANDY DOLOMITE - Mod Hard - Hard @17.3 (Elev 467.5) Silica Cemented Sandstone Hard - Very Hard | | Rough | | |
| | 18 | 1 Hr 22 Min | SS Fractured @ 17.9 (Elev. 446.9) | | Rough-Smooth | | |
| | 19 | 1 Hr 39 Min | 19.0-19.3 (Elev. 465.8 - 465.5) Gradation Milky Quartzite to Highly Silicious Dolomite | | Smooth | | |

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|---|--|--|--------------------|
| Norfolk Lake Bridges | | 102" Smith-Rock | |
| 62-PJ-S | | Elev. of Bottom of Hole 451.0 | |
| Geotechnician Robert Schmoker | | Steven M. Brin Co. | |
| 62-PJ-S | | Casing Record 481.81-565.31 | Depth 83.5 |
| NAME OF DRILLER Don Uchman | | Type 10' dia 3" Wal | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | TOTAL NUMBER CORE BOXES N/A | |
| Boring Method: Reverse Rotary | | Elev. of Water Variable | |
| DEPTH DRILLED INTO ROCK 31.8 | | DATE HOLE 6/4/80 | STARTED 6/20/80 |
| TOTAL DEPTH OF HOLE 33.8 | | ELEVATION TOP OF HOLE 467.05 Platform | |
| | | TOTAL CORE RECOVERY FOR TESTING Top of Rock | |
| | | SIGNATURE OF INSPECTOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | Remarks |
|-----------|-------------|------------|---|----------------|-------------|--------------|---|
| 464.8 | 20 | | | | | | |
| | 1 Hr 20 Min | | DOLOMITE - GRAY Hard - V Hard - Highly Silicious | | | Mod Smooth | 4:00 change from 14rpm to 20rpm |
| | 21 | | @ Elev. 461.1 (20.7) Dolomite - Buff - Gray Hard - Silic | | | | Stop 4:45 @21.25 |
| | 1 Hr 28 Min | | Dolomite - Buff - Grey Mod Hard | | | Smooth | 6/18/80 Start 9:57 2nd gear w/H2O Full load and Throttle 18rpm 120 stem and 17.5 DH Assy. |
| | 22 | | | | | | |
| | 1 Hr 15 Min | | | | | | |
| | 23 | | | | | | |
| | 1 Hr 15 Min | | | | | | |
| | 24 | | | | | | |
| | 50 Min | | | | | | |
| | 25 | | Cavity Elev. 460.15 to 460.0 (24.65 to 24.8) Dolomite - Buff-Gray Mod. Hard - Fractured | Slightly Milky | | Rough | |
| | 58 Min | | | | | Smooth | |
| | 26 | | | | | | |
| | 34 Min | | Elev. 458.6-458.5 Weathered Elev. 458.5- Claystone 458.4 Claystone | | | Rough | Stop 3:40 Drop in Stem Start 3:48 Rough action on drill when clay reached |
| | 27 | | Dolomite-Buff-Mod. Hard Dolomite - very sandy - soft Mod Hard Buff-Gray | | | Smooth | Stop 3:15 @28.0 6/20/80 Start 7:30 @ 28.9 2nd gear 20rpm Full w/ w/H2O 120 Stem 17.5 DH |
| | 35 Min | | | | | | |
| | 28 | | Dolomite Hard Grey Buff Silic (Prob Intense frac) | | | | |
| | 41 Min | | | | | | |
| | 29 | | Dolomite - Buff Mod Hard - Slightly Silic Mod Frac | | | | |
| | 42 Min | | | | | | |

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|--|--|---|--|
| Project: Norfolk Lake Bridges | | 10 SILL AND TYPE OF BIT: 102" Smith-Rock | |
| 62-P3-S | | 11 Elev. of Bottom of Hole: 451.0 | |
| Geotechnician: Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hein | |
| 62-P3-S | | 13 Coring Record: Depth 83.5 Type 10" dia 4" | |
| NAME OF DRILLER: Don Uchtman | | 14 TOTAL NUMBER CORE BOXES: N/A | |
| 11 DIRECTION OF HOLE: <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEC. FROM VERT. _____ | | 15 Elev. of Water: Variable | |
| Boring Method: Reverse Rotary | | 16 DATE HOLE: 6/4/80 15 STARTED 16/20/80 17 COMPLETED | |
| 17 TOTAL CORE RECOVERY FOR BORING: 31.8 | | 18 ELEVATION TOP OF HOLE: 467.05 Platform | |
| 19 TOTAL LENGTH OF HOLE: 33.8 | | 19 SIGNATURE OF INSPECTOR: _____ | |
| 20 TOTAL CORE RECOVERY FOR BORING: 31.8 | | 20 SIGNATURE OF INSPECTOR: _____ | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | Remarks |
|-----------|------------|------------|---|------------|----------------|--------------|-----------------|
| 454.8 | 30.0 | | | | | | |
| | 52 Min | | Dolomite - Buff - Mod. Hard, Slightly Fractured Slightly Silice | | | | Stop 10:40 32.6 |
| 31 | 52 Min | | | N/A | Slightly Milky | Smooth | Start 10:48 |
| 32 | 1 Hr 5 Min | | | | | | Discharge hose |
| 33 | 45 Min | | | | | | |
| 451.0 | | | Bottom of Rock Socket (Elev. 451.0) | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|--|--|-------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | OF 4 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT 102" Smith Rock | | | |
| 2. LOCATION 62-P4-N-Socket | | | | 11. Elevation of Bottom of Hole 427.5 | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain | | | |
| 4. HOLE NO. | | | | 13. Casing Record | | Depth 90' Type 10" O.D. | |
| 5. NAME OF DRILLER Don Uchtman | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. ELEVATION of Water 541.71 | | | |
| 7. Boring Method: Reverse Rotary | | | | 16. DATE HOLE STARTED 1/6/81 COMPLETED | | | |
| 8. DEPTH DRILLED INTO ROCK 32.6 | | | | 17. ELEVATION TOP OF HOLE 550.84 Platform | | | |
| 9. TOTAL DEPTH OF HOLE 35.69 | | | | 18. TOTAL CORE RECOVERY FOR BORING 462.59 TOG 19. SIGNATURE OF INSPECTOR 459.50 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|---------|------------|--|------------|-------------|--------------|---|
| 462.59' | | | | | | | |
| | 35 min. | 1 | SAND. | | | | 1/6/81 Start 10:30 7rpm w/H2O 1st 156.2' Stem & DH Assy |
| | 25 min. | 2 | CEMENT GROUT | | | | @12:22 @3.5 4th 28rpm w/H2O Stop 12:24 Start 12:29 Stop 2:40 Broken discharge hose. |
| 459.5 | 30 min. | 3 | Top of Rock - Average | | | | |
| | 40 min. | 4 | Dolomite - Buff - Mod Hard - Slightly Weathered | | | | |
| | 1 hr. | 5 | @ 4.0' - Dolomite - Buff - Grey - Mod Hard @ 4.4 - Dolomite - Brown - Hard Silic | | | | |
| | 31 min. | 6 | @ 5.3 - Dolomite - Dark - Grey - Mod Hard - Hard @ 5.7 - Dolomite - Buff - Grey - Mod Hard | | | | |
| 455.59' | 24 min. | 7 | @ 6.4 - Vuggy seam with pink Dolomite Crystals @ 6.5 - Dolomite - Buff Grey - Mod Hard | | | | 1/6/81 1/7/81 Start 9:20 28rpm w/H2O 4th 156.2' Stem & DH Assy |
| | 30 min. | 8 | @ 7.7 - 7.8 - Vuggy seam filled with Pink Dolomite @ 7.8 - Dolomite - Grey Mod Hard - Hard @ 8.3 - Dolomite - Buff Grey - Mod Hard | | | | |
| 452.59' | 21 min. | 9 | @ 9.4 - 9.6 - Clay - Red - Soft - Est. 1/2 of hole @ 9.6 - Dolomite - Buff | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | of 4 SHEETS | |
|--|-------|----------------------------------|--|--|-------------|--------------|---|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith Rock | | | |
| 1 LOCATION 62-P4-N-Socket | | | | 11 Elevation of Bottom of Hole 427.5 | | | |
| 2 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven Hains | | | |
| 3 HOLE NO. | | | | 13 Casing Record Depth Type | | | |
| 4 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Boring Method: Rotary | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 452.59 | 10 | 32 min | @ 10.0 - 12.1 - Cavern Clay filled - Est. (greater than 1/2 of hole) Clay - Soft - Red | | | | @10.0' 1st No H2O 7rpm Weight held 156.2 Stem & DH Assy |
| | 11 | 41 min | @ 10.6 - Cavern - Est. (less than 1/3 of hole) | | | | Stop 11:35 @11. Bit hung in cavern |
| | 12 | 29 min | @ 11.9 - Dolomite - Grey Hard - Very Hard - Siliceous | | | | Start 12:00 @12:25 - 12.1' 4th 28rpm W/ H2O |
| | 13 | 25 min | | | | | Stop 3:08 @17.8' |
| | 14 | 28 min | | | | | |
| 448.00 | 15 | 27 min | @ 15.5 - 15.6 - Clay filled seam - Est. (less than 1/8 of hole) with Calcite Crystals | | | | |
| | 16 | 45 min | @15.6 - Dolomite - Light Grey - Hard - Very Hard Siliceous | | | | |
| | 17 | 26 min | @ 16.6 - 17.0 - Clay filled seam - Est. (less than 1/8 of hole) Dolomite - Grey - Hard Very Hard - Siliceous | | | | |
| 444.79 | 18 | 47 min | @ 18.1 - Dolomite - Light Grey - Hard - Very Hard - Siliceous with Chert Modules - Milky | | | | 1/7/81 1/6/81 Start 7:30 4th 28rpm w/H2O 156.2 Stem & DH Assy |
| | 19 | 28 min | @ 19.0 - Chert - Milky - Very Hard | | | | |
| 442.53 | 20 | | | | | | |

039

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|--|----------------------------------|---|------------------------|
| DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 4 SHEETS |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | |
| 62-P4-N-Socket | | 11 Elevation of Bottom of Hole | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | |
| 1 NAME OF DRILLER | | 13 Casing Record | Depth Type |
| 4 DIRECTION OF HOLE | | 14 TOTAL NUMBER CORE BOXES | |
| VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> DEC. FROM VERT | | 15 ELEVATION of Water | |
| Boring Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | |
| 8 DEPTH CHILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | |
| 9 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | |
| | | 19 SIGNATURE OF INSPECTOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|--|------------|-------------|--------------|------------------------------------|
| 442.59 | 20 | 30 min | Chert - Milky - Very Hard | | | | 4th 28rpm w/H2O |
| | 21 | 1 hr 4 min | @ 20.2 - Quartzite - Very Hard - Clear - Milky | | | | 156.42' Stem & DH Assy |
| | 22 | 1 hr 25 min | @ 21.1 - Quartzite - Milky - Vuggy with Quartzite crystals and Goethite in vugs. | | | | Stop 9:52 |
| | 23 | 45 min | @ 21.8 - Dolomite - Grey Hard - Very Hard - Siliceous with chert nodules and Quartzite | | | | Grease swivel Start 10:15 @9.30 |
| | 24 | 30 min | @ 23.8 - Dolomite - Grey Buff - Mod Hard - Hard Numerous healed frac. with Iron stains on fractures. | | | | 1st 7rpm No H2O |
| | 25 | 44 min | @ 25.5 - Dolomite - Grey Mod Hard - Massive | | | | Rough drill action in vuggy quart. |
| | 26 | 1 hr 7 min | | | | | @2.16 - 10:27 |
| 435.99 | 27 | 34 min | | | | | 2nd W/ H2O . 17rpm |
| | 28 | 37 min | | | | | Stop 3:10 @26.6 |
| | 29 | 30 min | | | | | |
| | 30 | | | | | | |
| 432.59 | | | | | | | |

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|--|--|---|--|---------------------|
| DRILLING LOG | | Project No. DAGW 03-79-C-0055 | Contractor: Hagman Construction Co. | Sheet 001 SHEETS |
| 1. PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT | | |
| 2. LOCATION 62-B4-N-Socket | | 11. Elevation of Bottom of Hole | | |
| 3. Geotechnician | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4. HOLE NO. | | 13. Casing Record Depth Type | | |
| 5. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15. ELEVATION of Water | | |
| 7. Boring Method: Rotary | | 16. DATE HOLE STARTED COMPLETED | | |
| 8. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | | |
| 9. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | | |
| | | 19. SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|------------------------------|
| 432.59 | 30 | | @ Dolomite - Grey - Mod Hard - Brown - Hard Siliceous | | | | 2nd 17rpm w/H2O |
| | 31 | 35 min | @ 30.5 - Dolomite - Grey Mod Hard | | | | 156.42 Stem & Down Hole Assy |
| | 32 | 58 min | | | MILKY | SWELL | 331.0 - 10:14 |
| | 33 | 47 min | | | | | 4th 28 rpm |
| | 34 | 54 min | @ 34.4 - 34.45 - Shale seam - Black - Soft | | | | Stop 10:38 |
| | 35 | 35 min | @ 34.45 - Dolomite - Grey - Mod Hard | | | | Grease Swivel |
| | 36 | 5 min | | | | | Start 10:43 |
| 426.9 | | | | | | | Stop 1:33 BCH |
| | | | | | GREY | NOUGH | Design Bottom of Rock Socket |
| | | | | | MILKY | SWELL | 428.0 |
| | | | | | | | Bottom of Rock Socket |

041

SP. LINE LOG

DACA 03-79-C-1055

Marshall Construction Co.

LOG # 001

| | | | |
|--|--|---|--|
| 1. LOCATION Horseshoe Lake Bridges | | 10. SIZE AND TYPE OF BIT 1 1/2" Smith-Bar | |
| 2. ELEVATION 427.0 | | 11. ELEVATION OF BOTTOM OF HOLE 427.0 | |
| 3. GEARING 62-P4-S-socket | | 12. MANUFACTURER'S DESIGNATION OF DRILL Steven Hains | |
| 4. OPERATOR Robert Schmoker | | 13. CASING RECORD Depth 90' Type 1 1/2" C.D. | |
| 5. NAME OF DRILLER Don Uchtman | | 14. TOTAL NUMBER CORE BOXES | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15. ELEVATION OF WATER 541.90 | |
| 7. Boring Method: Reverse Rotary | | 16. DATE HOLE STARTED 1/13/81 COMPLETED 1/16/81 | |
| 8. DEPTH DRILLED INTO ROCK 27.2 | | 17. ELEVATION TOP OF HOLE 551.34' Platform | |
| 9. TOTAL DEPTH OF HOLE 34.19 | | 18. TOTAL CORE RECOVERY FOR BORING 461.19 TOP | |
| | | 19. SIGNATURE OF INSPECTOR 454.2 TOP | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|---|------------|-------------|--------------|---|
| 461.19 | | | | | | | |
| | 1 | 1 hr 40 min | 1) Dolomite - Light - Grey - Siliceous - Very Hard 2) Open Cavity - Sand Filled ROCK (SAND) (ROCK) @ 1.1 Cavity - Grout Filled | | | | 1/13/81 Start 11:10 156.42 Stem Kelly & DH Assy 1st 7rpm No H2O 2nd w/H2O 11:15 17rpm Stop 3:10 @3.6' |
| | 2 | 59 min | | | | | |
| | 3 | 36 min | GROUT | | | | |
| 457.59 | 4 | 37 min | Dolomite - Buff - Mod Hard @ 3.5 - Red Clay Stone | | | | 1/14/81 Start 7:20 2nd 17rpm w/H2O 156.42 Stem DH Assembly @4.5 7:55 4th 27rpm @6.9 1st trpm Rough drill action Stop 7:42 Clean out hole Start 7:50 |
| | 5 | 27 min | Dolomite - Buff - Mod Hard GROUT | | | | |
| | 6 | 19 min | | | | | |
| | 7 | 33 min | | | | | |
| 454.2 | 7 | | Average Top of Rock | | | | |
| | 8 | 50 min | @ 7.6 - Sand and Red Clay | | | | |
| | 9 | 1 hr 4 min | SAND & CLAY | | | | |
| | 10 | 5 min | | | | | |
| 451.19 | | | | | | | |

042

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|--|-------|----------------------------------|---|--|-------------|--------------|--|
| DRILLING LOG | | PROJECT NO. DACW 03-79-C-0055 | | Massman Construction Co. | | of 1 sheet | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P4-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth Type | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE MOLE STARTED COMPLETED | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| Drill | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 451.19 | 10 | | | | | | |
| | 11 | 9 min | Sand and Red Clay | | RED | ROUGH | 1st 7rpm w/H2O 156.42' Stem & DE Assembly Stop 11:50 Grease Swivel Start 12:17 @12.0' - 12:30 No H2O 2nd 17rpm @12:25 12.1' |
| | 12 | 29 min | @ 11.6 - Claystone - Red - Soft | | | | 1st 7rpm @1:00 12.6 2nd 17rpm @13.0' H2O @1:25 - 13.5' 4th 27rpm |
| | 13 | 45 min | @ 12.1 - Dolomite - Grey Hard - Very Hard - Siliceous | | | | Top of Rock Socket Stop 3:12 |
| 448.0 | 14 | 22 min | | | | | |
| | 15 | 24 min | @ 14.9 - Dolomite - Grey Mod Hard - Hard | | MILKY | | |
| | 16 | 24 min | @ 15.5 - Dolomite - Grey Buff - Mod Hard | | | | |
| | 17 | 47 min | @ 16.3 - Quartzite - Milky - Hard - Very Hard @ 16.8 - Dolomite - Grey - Mod Hard - Hard Siliceous | | | SMOOTH | 1/14/81 1/15/81 Start 7:37 w/H2O 4th 27rpm 156.42 Stem & DE Assembly @17.0' @19' 2nd 17rpm rough drill action metal in hole @:40 19.5' 4th rpm 27 |
| 444.19 | 18 | 35 min | @ 17.1 - Quartzite - Milky - Hard @ 17.5 - 18.1 - Quartzite Milky - Light Blue - Hard - Vuggy @ 18.1 - Quartzite - Milky - Hard | | | | |
| | 19 | 33 min | | | | | |
| | 20 | 1 hr 5min | @ 19.5 - Dolomite - Grey - Hard - Very Hard - Siliceous | | | | |
| 441.19 | 20 | | | | | | |

043

DRILLING LOG

PROJECT NO.
DACW 03-79-C-0055

Messer Construction Co.

1 of 1 SHEETS

Norfolk Lake Bridges

LOCATION
62-P4-S-Socket

Geotechnician

HOLE NO.

NAME OF DRILLER

DIRECTION OF HOLE

☐ VERTICAL ☐ INCLINED

DEG. FROM VERT

Boring Method: Rotary

DEPTH DRILLED INTO ROCK

TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT

Elevation of Bottom of Hole

12 MANUFACTURER'S DESIGNATION OF DRILL

13 Casing Record Depth Type

14 TOTAL NUMBER CORE BOXES

15 ELEVATION of Water

16 DATE HOLE STARTED COMPLETED

17 ELEVATION TOP OF HOLE

18 TOTAL CORE RECOVERY FOR BORING

19 SIGNATURE OF INSPECTOR

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|------------|------------|---|------------|-------------|--------------|---------------------------|
| 441.19 | 20 | | @ 20.0 - Cherty - Dolomite - Grey Brown Hard - Very Hard | | | | con't |
| | 43 min | | | | | | 4th 27rpm w/H2O |
| | 21 | | @ 21.1 - Dolomite - Dark Grey - Hard - Very Hard - Siliceous | | MILKY | | 156.42 Stem & DH Assembly |
| | 1 hr 4 min | | @ 21.5 - Dolomite - Brown - Very Hard - Fractures with Iron stains on Fractures Planes - Highly - Siliceous | | | | Stop 10:40 Grease Swivel |
| | 48 min | | @ 21.9 - Dolomite - Buff - Grey - Mod Hard Hard | | | | 27rpm w/H2O |
| | 22 | | @ 23.7 - 23.8 - Shale Black - Soft | | | | 4th 27rpm w/H2O |
| | 1 hr 6 min | | @ 23.8 - Dolomite - Grey - Hard - Siliceous | | GREEN | | Stop 3:13 @25.5 |
| | 58 min | | @ 24.9 - 25.0 - Shaley Dolomite - Black - Soft - Mod Hard | | | | |
| 435.69 | 39 min | | @ 25.0 - Dolomite - Grey - Mod Hard - Siliceous | | | | 1/15/81 |
| | 26 | | @ 26.1 - Dolomite - Grey - Mod Hard - Slightly Fractured | | | | 1/16/81 |
| | 45 min | | @ 27.5 - Dolomite - Grey - Mod Hard - Slightly Fractured with Fractures Silica Filled | | | | Start 7:34 4th |
| | 27 | | @ 28.2 - Dolomite - Grey - Mod Hard | | MILKY | | 27rpm w/H2O |
| | 25 min | | @ 29.4 - Dolomite - Grey - Mod Hard - Hard - Slightly Silic | | | | 156.42 Stem & DH Assembly |
| | 32 min | | | | | | |
| | 29 | | | | | | |
| | 32 min | | | | | | |
| 431.19 | 30 | | | | | | |

044

| | | | | | | | |
|---|-------|-------------------|---|---|-------------|-------------------|--|
| DRILLING LOG | | DAC# 03-79-C-0055 | | Hassman Construction Co. | | Job # 5-111 | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT | | | |
| 2. LOCATION 62-P4-S-Socket | | | | 11. Elevation of Bottom of Hole | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4. HOLE NO. | | | | 13. Casing Record | | Depth Type | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. ELEVATION of Water | | | |
| 7. Boring Method: Rotary | | | | 16. DATE HOLE | | STARTED COMPLETED | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 431.19 | 30 | | | | | | |
| | 31 | 35 min | Dolomite - Grey - Mod Hard - Hard - Slightly Silic | | | | con't 4th 27rpm w/H2O 156.42 Stem & Down Hole Assembly |
| | 32 | 30 min | | | MILKY | SMOOTH | |
| | 33 | 34 min | @ 32.5 - Dolomite - Light Grey - Mod Hard | | | | |
| | 34 | 19 min | | | | | Design Bottom of Rock Socket 428.0 |
| 427.0' | | | | | | | |

045

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|--|--|----------------------------------|--|---|--|--------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Of 3 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Smith 102" Rock | | | |
| 2 LOCATION 62-P5-N-Socket | | | | 11 Elevation of Bottom of Hole 406.8 | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth 120.5' | | Type 1/2 TK 10' | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water Varies 548.99 | | | |
| 7 Boring Method: Reverse Rotary | | | | 16 DATE HOLE 7/21/80 | | 17 STARTED 7/25/80 | |
| 8 DEPTH DRILLED INTO ROCK 27.5' | | | | 18 ELEVATION TOP OF HOLE 562.7' (Platform) | | | |
| 9 TOTAL DEPTH OF HOLE 29.13 | | | | 19 TOTAL CORE RECOVERY FOR BORING 435.925 TOG | | | |
| | | | | 20 SIGNATURE OF INSPECTOR 434.3 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------------|------------|---|------------|-------------|--------------|--|
| 435.925 | | | | | | | |
| | 5 Min | | CEMENT GROUT | | | | Start 2:35 1st gear No H2O 7rpm 186.15 Stem Kelly & Down Hole Assembly Stop @ 2' @ 3:00 |
| 434.3 | 29 Min | | Top of Rock Elev 434.3 | | | | Avg. Top of Rock |
| | 2 | | Dolomite - Grey - Soft - Mod Hard - Slightly Weathered | | Muddy | | Start 7:20 1st gear Full load No H2O 8rpm H2O on @ 7:45 @ 2.1 2nd gear 18rpm @ 8:37 2.8 1st gear @ 8:50 @ 3.0 2nd gear @ 9:05 - 3.3' Stop 10:35 Template Adjust Bottom of Casing 432.0 |
| 432.0 | 1 Hr 33 Min | | @ 2.7' Dolomite - Buff - Grey - Mod Hard | | | | |
| | 3 | | @ 3.3 - 3.8' Dolomite - Frac w/Fe stains on Frac planes | | | | |
| | 57 Min | | @ 3.8 Dolomite - Buff - Grey Mod Hard | | | | |
| | 4 | | | | | | |
| | 58 Min | | | | | | Start 10:55 Stop 11:55 Start 12:30 Stop 1:20 Start 1:29 Stop 3:15 @ 7.5 |
| | 5 | | | | | | |
| | 47 Min | | @ 5.8 - 6.1' Dolomite - Frac with Fe stained Jts | | | | |
| | 6 | | @ 6.1' Dolomite - Grey Buff - Mod Hard - Hard Silic | | Milky | | |
| | 1 Hr 50 Min | | | | | | |
| | 7 | | | | | | |
| | 2 Hrs | | @ 8.0' Dolomite - Buff Fractured w/Fe stains on Jts & Frac - Mod Hard | | | | |
| 427.3 | 58 Min | | @ 8.9' Dolomite - Buff - Grey - Mod Hard | | | | |
| | 9 | | | | | | |
| | 1 Hr 5 Min | | | | | | |
| | 10 | | | | | | |

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|---|--|---|--|---|--|-----------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet of 3 sheets | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 LOCATION 62-P5-N-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO. | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT. | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|--|------------|-------------|--------------|--|
| | | 48 Min | @ 10.5' Dolomite - Grey - Mod Hard | | | | |
| 11 | | 39 Min | @ 11.4 Dolomite - Buff - Grey | | | | Stop - 3:15 @ 13.3' |
| 12 | | 1 Hr | @ 11.9 - 12.1' Soft weathered Dolomite layer (white) @ 12.1 0 12.3' Dolomite - Buff - Grey - intensely frac - Mod Hard with pods of white weathered dol @ 12.5' Thin shale layer @ 12.35' Dolomite - Buff - Grey - Mod Hard - Slightly Frac | | | | Start 7:45 2nd gear w/H2O Full wt 18rpm |
| 13 | | 55 Min | @ 13.6 - 13.7' Shaly - Dolomite - green, black - soft - med hard | | | | H2O off 1st gear @ 16' |
| 14 | | 55 Min | @ 13.7' Dolomite - Buff - Mod Hard - Slightly Frac | Milky | Smooth | | @9:58 Rough Drill on bottom of cavern part void below 16 |
| 15 | | | @ 14.8 Dolomite - Grey - Mod Hard | | | | 2nd gear 18rpm H2O on @ 16.5 @ 10:38 |
| 16 | | 38 Min | @ 15.6 - Cavern - 16.0' quartz & calcite crystals in cavern (Partial cavern 16-16.5') | | | | Stop 11:30 Gasket out of stem 17.4' Start 11:50 |
| 17 | | 1 Hr 8 Min | @ 16.5 Dolomite - Grey Mod Hard | | | | |
| 18 | | 1 Hr 6 Min | @ 16.9' Dolomite - Buff - Mod Hard - Frac @ 17.1 - 17.2' | | | | |
| 19 | | 1 Hr 28 Min | @ 17.6 Dolomite - Buff - Grey - Slightly frac - Mod Hard | | | | |
| 20 | | 55 Min | @ 19.8 - 20' Weathered Dolomite (white) | | | | |

047

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|--|--|----------------------------------|--|---|--|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | of 3 sheets | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P5-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF CHILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|--|------------|-------------|--------------|---|
| | | 1 Hr 10 Min | Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | Stop 3:15 @ 20.6' |
| 21 | | 1 Hr 7 Min | @ 21.9' Thin seam of white weathered Dolomite | | | | 7/25/80 Start 7:35 2nd 18 rpm Full load 186.75 Stem Kelly DH Assy. w/H20 |
| 22 | | 58 Min | Dolomite - Buff - Mod Hard - Frac w/Fe stains on frac. | | | | Stop 11:00 Engine check Start 11:05 3rd gear @27.5' |
| 23 | | 55 Min | | | Milky | Smooth | 2:27 30rpm |
| 24 | | 50 Min | @ 24.6' Dolomite - Grey mod Hard | | | | |
| 25 | | | @ 24.9' - 24.95' Black shale seam | | | | |
| 26 | | 1 Hr | Dolomite - Grey - Mod Hard | | | | |
| 27 | | 57 Min | @ 26.2' Siltstone seam | | | | |
| 28 | | 38 Min | @ 26.7' Black shale seam | | | | |
| | | 25 Min | @ 27.5 - 27.8' Chert - Black | | | | |
| | | | @ 27.8 Dolomite - weathered silicious - mod hard | | | | |
| 406.8 | | | Bottom of Hole - 406.0 | | | | Actual bottom of Rock Socket |

048

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|---|-------|--|---|---|-------------|--------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. of 3 SHEETS | | | |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT Smith 102" Rock | | 11 Elevation of Bottom of Hole 407.3 | | | |
| 62-P5-S-Socket | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain | | 13 Casing Record Depth 136.5' Type 4 IN 10' | | | |
| 1 Geotechnician Robert Schmoker | | 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water Varies 550.43 | | | |
| 2 NAME OF DRILLER Don Uchtman | | 16 DATE HOLE 7/8/80 | | 17 ELEVATION TOP OF HOLE 567.60 Platform | | | |
| 3 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 18 TOTAL CORE RECOVERY FOR BORING 431.6 TOR | | 19 SIGNATURE OF INSPECTOR 434.51 TOG | | | |
| 4 Boring Method: Reverse Rotary | | 20 DEPTH DRILLED INTO ROCK 24.5 | | 21 TOTAL DEPTH OF HOLE 27.4 | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 434.51 | | 15 Min | Cement Grout | | | | Start 1st gear 7rpm 187.42' Stem & Kelly w/H2O Stop 12:58 Start 1:00 Stop 1:39 Start 1:40 Stop 1:42 Start 1:50 Stop 2:52 Start 2:57 |
| | 1 | 10 Min | | | Muddy | Smooth | |
| | 2 | 15 Min | | | | | |
| 431.6 | 3 | | Avg. Top of Rock 431.6 | | | | Avg. Top of Rock |
| | | 55 Min | Dolomite - Grey - Mod Hard Fractured | | | | |
| | 4 | 1 Hr 22 Min | @ 4.5' Dolomite - Grey - Mod Hard | | | | |
| 429.4 | 5 | | | | | | Bottom of Casing 429.4 |
| | | 45 Min | | | Milky White | | |
| | 6 | 1 Hr 20 Min | @ 6.4' Dolomite - Dark Grey Mod Hard - Hard - Silic | | | | Start 7/9/80 @ 5.6' 7:24 2nd gear 17rpm Full wt. 187.42 Stem & DH Assy w/H2O |
| 427.3 | 7 | | | | | | Top of Rock Socket |
| | | 1 Hr 3 Min | @ 7.4' Dolomite - Buff Mod Hard | | | | |
| | 8 | 1 Hr 10 Min | | | | | |
| | 9 | 1 Hr 15 Min | | | | | |
| | 10 | | | | | | |

049

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|---|--|--|---|-------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 3 SHEETS |
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| 2 LOCATION 62-P5-S-Socket | | 11 Elevation of Bottom of Hole | | |
| 3 Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4 HOLE NO. | | 13 Casing Record Depth Type | | |
| 5 NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15 ELEVATION of Water | | |
| 7 Boring Method: Rotary | | 16 DATE MOLE STARTED COMPLETED | | |
| 8 DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| 9 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|----------------|--|---------------|-------------|---------------|---|
| 424.51 | 10 | | | | | | |
| | 11 | 1 Hr 23 Min | DOLOMITE - Grey - Grey-Black Mod Hard - Hard Silic Mod Dolomite - Grey - Mod Hard | | | Rough | Stop 1:53 @10.8 Engine Check Start 1:58 Stop 2:26 @11.4 Fuel and Grease |
| | 12 | 1 Hr 21 Min | Dolomite - Mod Hard - Hard Silic Dolomite - Grey - Hard | | White | | 7/9/80 Start 7:16 @11.4 2nd gear with H20 130 psi |
| | 13 | 2 Hr 18 Min | Dolomite - Mod Hard with vugs with calcite crystals | | | Med Smooth | |
| | 14 | 1 Hr 3 Min | Dolomite - Mod Hard - occ chert seams & small partings and calcite | | | Smooth | |
| | 15 | 1 Hr 17 Min | Dolomite - light grey with sandstone & shale partings with calcite crystals w/ Fe staining on frac planes | | | Rough | |
| | 16 | 47 Min | Dolomite - Grey w/Fe stainings & calcite crystals | | | Smooth | |
| | 17 | 6 Min | SANDSTONE Fractured Dolomite | | | Rough | |
| | 18 | 28 Min | DOLOMITE - light grey - Fe staining - mod hard - sandstone | Red Sandy | | | |
| | 19 | 1 Hr | Dolomite - Light - mod hard | White Lime | | Smooth | |
| | 20 | 55 Min | Dolomite - hard - light grey | | | | |
| | 21 | 1 Hr 6 Min | Dolomite - mod-hard Light | | | | Stop 8:45 Service drill Start 7:17 a.m. |

050

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | of 3 sheets | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P5-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------------|------------|---|------------|-------------|--------------|---|
| 414.51 | 20 | | | | | | |
| | 1 Hr 17 Min | | Dolomite - Hard - Dark Grey | | White | Smooth | 2nd gear @26.50 ppm & 17-19 rpm on Kelly H2O @ 150 psi |
| | 21 | | | | | | |
| | 1 Hr 17 Min | | Dolomite - Hard - Dark Grey | | | | |
| | 22 | | | | | | |
| | 1 Hr 18 Min | | | | | | |
| | 23 | | | | | | |
| | 1 Hr 20 Min | | 1' layer of soft weathered Dolomite | | | Rough | |
| | 24 | | Dolomite - Grey - Grey-Black - Mod Hard - Hard | | | | Rough drilling in weathered area. |
| | 1 Hr 2 Min | | | | | | 1st gear 7rpm @24' 2nd gear 17rpm @24' 24.7' |
| | 25 | | Dolomite - Grey - Black - Mod Hard w/pods of white weathered Dolomite | | Smooth | | Stop 3 11 @25.4 |
| | 1 Hr 42 Min | | | | | | 7/14/80 Start 9:42 1st gear w/H2O 187.42 Stem Kelly DH Assy Full load 8rpm Stop @ 10:55 Air leak |
| | 26 | | | | | | |
| | 2 Hr 19 Min | | | | | | |
| | 27 | | | | | | |
| 407.1 | | | Bottom of Hole - 407.1 | | | | Actual Bottom of Rock Socket Start 9:56 @26 1st gear 8rpm W/H2O 186.175 Stem Kelly DH Assy Stop 11:40 26.7 Start 7:00 186.175 Stem Full load w/H2O 2nd 18rpm 26.7 Start |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Co. | |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Beck | | 11 Elevation of Bottom of Hole 408.5' | |
| 62-P6-N-Socket | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | 13 Casing Record Depth 121.0' Type 10" O.D. | |
| Geotechnician Robert Schmoker | | 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water 542.32 | |
| NAME OF DRILLER Don Uchtman | | 16 DATE HOLE STARTED 1/24/81 COMPLETED 1/28/81 | | 17 ELEVATION TOP OF HOLE 556.04' TOP | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 18 TOTAL CORE RECOVERY FOR BORING 436.34' TOP | | 19 SIGNATURE OF INSPECTOR 433.9' TOP | |
| Boring Method: Reverse Rotary | | 2 DEPTH DRILLED INTO ROCK 25.70 | | 3 TOTAL DEPTH OF HOLE 28.24 | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|---|------------|-------------|--------------|---|
| 436.44' | | 32 min | SAND | | | | 1/24/81 Start 7:30 1st 7rpm No H2O 186.3' stem kelly & DH Assy |
| | 1 | 15 min | CEMENT GROUT Sandy clay | | Muddy | Rough | @1.0 2nd 17rpm No H2O Stop 8:06 shift Start 8:51 Mal. H2O on @10:00 @3.5 Stop 10:05 eng Start 10:00 Top of Rock |
| 433.9' | 2 | 5 min | Dolomite - Buff - Grey Hard - Siliceous | | | | Stop 10:15 @4.0 Weld lugs Start 10:45 Stop 11:40 discharged plug Start 12:45 |
| | 3 | 1 hr 3 min | @ 4.1 Dolomite - Buff - Grey Hard - Siliceous - with Chert - Nodules - Grey Brown | | | | |
| | 4 | 1 hr 25 min | @ 4.5 Dolomite - Grey - Mod Hard - Siliceous | | | | |
| | 5 | 1 hr 3 min | @ 5.3 Dolomite - Brown - Hard Siliceous | | Milky | Smooth | |
| | 6 | 57 min | @ 6.2 Dolomite - Grey - Hard Siliceous | | | | |
| 429.0 | 7 | 1 hr 24 min | @ 8.1 Shale - Black - Soft | | | | Top of Rock 429.0 1.25' @1 Start 1:40-4:10 2 rpm w H2O 186.3' stem kelly DH Assy |
| | 8 | 1 hr 15 min | @ 8.45 Dolomite - Grey - Hard Siliceous | | Grey | Rough | |
| | 9 | 57 min | @ 9.4 Dolomite - Light Grey Mod Hard - Hard | | Milky | Smooth | |
| 426.44' | 10 | | | | | | |

| | | | | | | | |
|---|--------|----------------------------------|--|---|-------------|--------------|----------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Page 3 of 3 | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT | | | |
| 2. LOCATION 62-R5-N-Socket | | | | 11. Elevation of Bottom of Hole | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4. HOLE NO. | | | | 13. Casing Record Depth Type | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT | | | | 15. ELEVATION OF WATER | | | |
| 7. Boring Method: Rotary | | | | 16. DATE HOLE STARTED COMPLETED | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. SIGNATURE OF INSPECTOR | | | |
| DRILL | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 426.44 | 10 | | | | | | |
| | 53 min | | Dolomite - Light Grey - Mod Hard - Hard | | | | cont |
| | 11 | | | | | | 4th 2 1/2" rpm w/H2O |
| | 47 min | @11.4 | Dolomite - Grey - Mod Hard | | | | 186.3" stem kelly |
| | 12 | | | | | | & DH Assy |
| | 52 min | | | | | | Stop 12:14 |
| | 13 | | | | | | Grease swivel |
| | 58 min | @13.4 | Shale - Black - Soft | | | | Start 12:26 |
| | 14 | | @13.5 Dolomite - Grey - Mod Hard - Massive | | | | Stop 3:05 @ 14.0' |
| | 45 min | | | | | | |
| | 15 | | @15.0 - 15.1 Shale - Black - Soft | | | | 1/27/81 |
| | 49 min | @15.1 | Dolomite - Grey - Mod Hard - Hard - Massive - Slightly Silic | | | | Start 7:25 |
| | 16 | | | | | | 4th 2 1/2" rpm w H2O |
| | 56 min | @16.1 | Dolomite - Buff - Grey Hard - Siliceous | | | | 186.3" stem Kelly |
| | 17 | | @17.1 Dolomite - Buff - Brown Hard - Very Hard - Siliceous | | | | & DH Assy |
| | 37 min | @17.6 | Dolomite - Buff - Grey Mod Hard - Slightly Silic | | | | Stop 10:32 |
| | 18 | | Fractures | | | | Grease swivel |
| | 53 min | @17.8 - 18.2 | Cavern - Clay and Calcite crystal filled (est -1/8 of hole) | | | | Start 10:38 |
| | 19 | | @18.3 Dolomite - Grey - Mod Hard - Fractured Silic | | | | |
| | 41 min | | | | | | |
| | 20 | | | | | | |

053

DRILLING LOG

Project No.
DACW 03-79-C-0055

Contract No.
Massman Construction Co.

of 3 sheets

| | | | |
|--|--|---|--|
| PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT | |
| 2. LOCATION 62-P6-N-Socket | | 11. Elevation of Bottom of Hole | |
| 3. Geotechnician | | 12. MANUFACTURER'S DESIGNATION OF DRILL | |
| 4. HOLE NO. | | 13. Casing Record Depth Type | |
| 5. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15. ELEVATION OF WATER | |
| 7. Boring Method: Rotary | | 16. DATE HOLE STARTED COMPLETED | |
| 8. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | |
| 9. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | |
| | | 19. SIGNATURE OF INSPECTOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 416.44 | 20 | 43 min | Dolomite - Grey - Mod Hard - Silic - Fracture | | | | 1/27/81 4th 27rpm w/H2O 186.3' stem kelli DH Assy Stop 2:10 Grease Swivel Start 2:23 Stop 3:13 |
| | 21 | 35 min | Dolomite - Buff - Mod Hard - Silic - Fracture | | | | |
| | 22 | 40 min | @ 21.9 Dolomite - Dark Grey - Mod Hard - Massive | | | | |
| | 23 | 39 min | | | | | |
| 412.04 | 24 | 32 min | | | | | |
| | 25 | 24 min | | | | | 1/27/81 1.28 ft Start 2:19 4th 27rpm w/H2O 186.3' stem kelli & DH Assy |
| | 26 | 18 min | @ 26.2 Dolomite - Dark Grey - Mod Hard - Fractured | | | | |
| | 27 | 16 min | | | | | |
| 408.2 | 28 | | | | | | Close Bottom of Rock Socket 409.0 Bottom of Rock Socket |

AD-A130 553

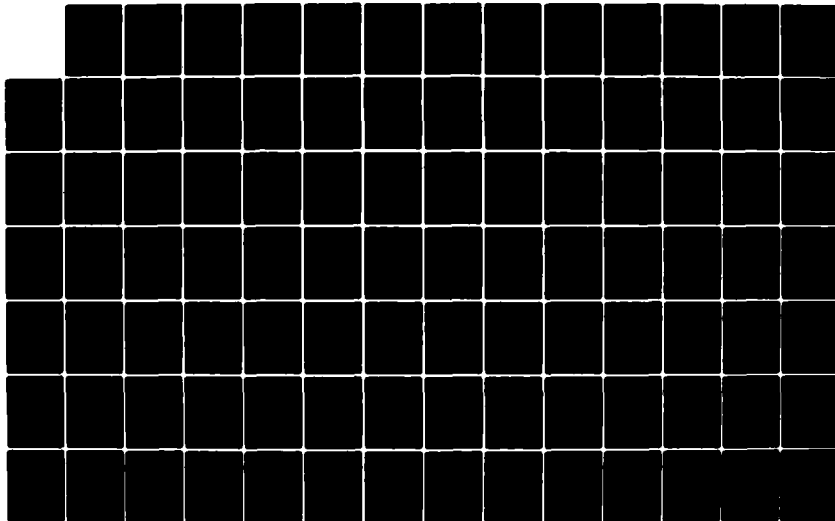
NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS
WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT
LITTLE ROCK ARK R L CRUTCHFIELD JUN 83

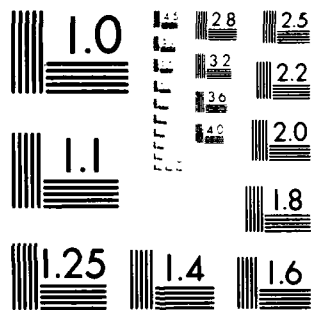
25

UNCLASSIFIED

F/G 13/13

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

| Drilling Log | | Project No. | | Contractor | | Sheet | |
|--|--------------|---------------|---|---|-------------|--------------|--|
| Norfolk Lake Bridges | | DAG-79-C-0055 | | Marshall Construction Co. | | of 3 | |
| 62-P6-S-Socket | | | | 102 Smith-Rock | | | |
| Geotechnician Robert Schmoker | | | | Elevation of Bottom of Hole 408.5' | | | |
| Hole No. | | | | Manufacturer's Designation of Drill Steven Hains | | | |
| Name of Driller Don Uchtman | | | | Casing Record Depth Type 121.0 10' OD | | | |
| Direction of Hole <input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Inclined <input type="checkbox"/> Dec from Vert | | | | Total Number Core Boxes | | | |
| Boring Method: Reverse Rotary | | | | Elevation of Water | | | |
| Depth Drilled into Rock 25.90 | | | | Date Hole Started Completed 1/29/81 2/4/81 | | | |
| Total Depth of Hole 29.73 | | | | Elevation Top of Hole 556.38' Platform | | | |
| | | | | Total Core Recovery for Boring 437.73 TOG | | | |
| | | | | Signature of Inspector 433.9 TOR | | | |
| Elevation | Depth | Drill Rate | Classification of Materials (Description) | Water Loss | Water Color | Water Action | Remarks |
| 437.73' | 11 min | | SAND | | | | 1/29/81 Start 12:58 1st 7rpm w/H2O 186.3' stem - Kelly & DH Assy 4th @ 2:09 4.3' Stop 2:45 |
| | 16 min | | AND | | Muddy Grey | ROUGH | |
| | 16 min | | CEMENT GROUT | | | | |
| 433.9' | 11 min | | Average Top of Rock | | | | |
| | 57 min | | Dolomite - Grey - Mod Hard - Hard - Massive | | | | |
| 432.73' | | | | | | | 1/29/81 2/2/81 |
| | 1 hr. 12 min | | @ 5.4 Cherty - Dolomite - Brown - Grey - Hard | | | | Start 8:00 4th 27rpm no H2O 186.3' stem Kelly & DH Assy H2O lines frozen Stop 12:36 Grease swivel Start 12:53 |
| | 1 hr. 9 min | | @ 5.7 Dolomite - Grey - Mod Hard - Hard | | | | |
| | 1 hr. 17 min | | @ 6.8 Dolomite - Grey - Hard Silic | MILKY | SMOOTH | | |
| 429.00' | 1 hr. 2 min | | @ 8.8 Dolomite - Grey - Mod Hard - Hard | | | | Top of Rock Socket |
| | 47 min | | | | | | 055 |

| DRILLING LOG | | Project No. DACW 79-C-0055 | | Contractor: Massman Construction Co. | | of 3 SHEETS | |
|--|-------|-------------------------------|--|---|-------------|-------------------|--|
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE | | | |
| 62-P6-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method: Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 427.73 | 10 | 1 hr 6min | Dolomite - Grey - Mod Hard | | | | 186.3' kelly & DH Assy 4th 27rpm No H2O Stop 3:12 @11.3 |
| | 11 | @ 10.9 | Dolomite - Light Grey- Mod Hard - Massive | | | | 2/2/81 |
| | 12 | 1 hr 16min | | | | | 2/3/81 |
| | 13 | 39 min | | | MILKY | SMOOTH | Start 7:52 4th rpm No H2O 186.3' kelly & DH Assy Stop 9:06 Unhook H2O lines Start 9:38 Stop 3:17 @20.0 |
| | 14 | 52 min | @ 13.5 Dolomite - Dark Grey - Massive - Mod Hard - Hard | | | | |
| | 15 | 43 min | @ 15.2 Shale - Black - Soft | | | | |
| | 16 | 44 min | @ 15.3 Dolomite - Dark Grey - Mod Hard - Hard - Slightly Silic | | GRAY | ROUGH | |
| | 17 | 55 min | @ 16.8 Dolomite - Brown - Grey Hard - Siliceous | | | | |
| | 18 | 49 min | @ 18.2 Dolomite - Grey - Hard Siliceous - Vuggy with calcite filled vugs | | MILKY | SMOOTH | |
| | 19 | 43 min | | | | | |
| | 20 | 36 min | @ 19.1 Dolomite - Grey - Hard Siliceous - Vuggy - Clay filled | | MURKY | | |

056

| DRILLING LOG | | Project No. DACW 99-C-0055 | | Contractor: Massman Construction Co. | | or 3 SHEETS | |
|---|-------|-------------------------------|---|---|-------------|-------------------|--|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF HOLE | | | |
| 2 LOCATION 62-P6-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 417.73' | 20 | | | | | | |
| | | 37 min | Dolomite - Grey - Hard Siliceous - Vuggy with clay filled vugs @20.2 | | MUDDY | | 2/4/81 Start 7:55 @20.0 4th 27 rpm w/H2O 186.3' Kelly & DH ASSY Stop 1:06 BOH |
| | 21 | | Dolomite - Grey - Hard - Siliceous - Fractured with Iron Stains on Frac. @21.1 | | | | |
| | | 44 min | Dolomite - Buff - Mod Hard - Slightly Fractured | | | | |
| | 22 | | | | | | |
| | | 34 min | @22.6 Dolomite - Grey - Mod Hard - Massive | | | | |
| | 23 | | | | | | |
| | | 37 min | | | MILKY | SMOOTH | |
| | 24 | | | | | | |
| | | 35 min | | | | | |
| | 25 | | | | | | |
| | | 38 min | | | | | |
| | 26 | | | | | | |
| | | 27 min | | | | | |
| | 27 | | @27.8 Shale - Black - Soft | | | | |
| | | 29 min | @27.85 Dolomite - Grey - Mod Hard - Massive | | | | |
| | 28 | | | | GREY | ROUGH | |
| | | 24 min | | | | | |
| | 29 | | | | | | |
| | | 6min | | | MILKY | SMOOTH | |
| 408.0' | | | | | | | 057 |
| | | | | | | | Bottom of Rock Socket |

| | | | | | |
|---|--|---------------------------------------|--|---|--|
| HOLE LOG | | DACW 03-74-10181 | | Hessman Construction Co. | |
| Norfolk Lake Bridges | | 102" Smith Rock | | Elevation of Bottom of Hole 408.9' | |
| 62-P7-N-Socket | | Steven M. Hain Co. | | Type 10" OD 4" wall | |
| Geotechnician Robert Schmoker | | Casing Record 121.0 | | Depth 432.2 | |
| NAME OF DRILLER Don Uchtman | | TOTAL NUMBER CORE BOXES | | ELEVATION of Water 541.45 | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | DATE MOLE 9/10/80 | | COMPLETED 9/12/80 | |
| Boring Method: Reverse Rotary | | ELEVATION TOP OF HOLE 446.23 Platform | | TOTAL CORE RECOVERY FOR BORING 433.5 T.O.C. | |
| DEPTH DRILLED INTO ROCK 24.8' | | SIGNATURE OF INSPECTOR | | 438.72 T.O.C. | |
| TOTAL DEPTH OF HOLE 29.83' | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|---|------------|-------------|--------------|--|
| | | 5 Min | CEMENT GROUT | | | | 9/10/80 Start 8:05 No H2O 1st gear 7rpm 2nd gear 17rpm @8:33 @2.8' @9:20 @5.6' H2O on H2O off 9:22 (Rough drill action) Stop 10:00 Stem Adj Start 10:05 in 3rd gear 26rpm Stop 10:15 Fuel drill engines Start 10:30 Stop 11:02 Start 11:11 w/H2O 2nd gear 17 rpm Stop 11:30 10' cam adjustment Start 2:20 2nd w/H2O 17rpm 1st gear @7.2:35 2nd gear @3:40 @7.5 3rd @4:04 @7.5' |
| 433.6 | 5 | 11 Min | Top of Rock | | | | Avg. Top of Rock |
| | 6 | 54 Min | Dolomite - Buff - Mod Hard w/occasional chert nodules | | | | |
| 432.2 | 7 | 1 Hr 41 Min | | | | | Bottom of Casing |
| | 8 | 1 Hr 40 Min | | | | | |
| | 9 | 25 Min | | | | | Stop 4:15 @3. |
| 428.90 | 10 | 27 Min | | | | | Top of Rock Socket |

| ELEVATION | | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--|--------|------------|--|------------|-------------|--------------|---|
| 428.73 | | | | | | | | |
| | | 28 Min | | Dolomite - Grey - Buff Mod Hard - Frac | | | | Stop 11:37 Mark Kelly Start 11:39 |
| | | 25 Min | | | | | | |
| | | 23 Min | | @ 11.9 - 12.3 - Clay - Red Filled pod 1/3 of hole @ 12.3 - Dolomite - Grey Mod Hard - Slightly Frac | | | | |
| | | 20 Min | | | | | | |
| | | 20 Min | | @ 14.6 Dolomite - Buff - Grey - Mod Hard - Intensely Frac | | | | |
| | | 22 Min | | | | | | |
| | | 20 Min | | | | | | |
| | | 30 Min | | Dolomite - Grey - Mod Hard | | | | |
| | | 22 Min | | | | | | |
| | | 27 Min | | | | | | |

| | | | | | | | |
|---|--|---|--|---|--|--------------------------|--|
| DRILLING LOG | | Project No. DAGN 03-79-C-0055 | | Contractor: Massman Construction Co. | | Of 3 sheets | |
| 1 LOCATION Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 Geotechnician 62-P7-N-Socket | | | | 11 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 HOLE NO | | | | 12 Casing Record | | Depth Type | |
| 4 NAME OF DRILLER | | | | 13 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 14 ELEVATION of Water | | | |
| 6 Boring Method: Rotary | | | | 15 DATE HOLE | | STARTED COMPLETED | |
| 7 DEPTH DRILLED INTO ROCK | | | | 16 ELEVATION TOP OF HOLE | | | |
| 8 TOTAL DEPTH OF HOLE | | | | 17 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 18 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|--|------------|-------------|--------------|--|
| | 21 Min | | Dolomite - Grey - Mod Hard | | | | 3rd gear 26rpm 176.8' Stem & DH Assy. w/H2O 1st @1:45 H2O off Stop 2:19 Drill Adj. Start 3:20 1st 7rpm H2O on @3:40 2nd gear 17rpm @3:50 3rd-26rpm @4:00 Stop 4:20 |
| 21 | 26 Min | | | | | | |
| 22 | 22 Min | | | | | | |
| 23 | 18 Min | | | | | | |
| 24 | 32 Min | | | | | | |
| 25 | 57 Min | | @ 24.6 - 25.7 - Cavern over 1/2 of hole w/pink calcite crystals. Clay on bottom of cavern. | | | | |
| 26 | | | Dolomite - Grey - Mod Hard | | | | |
| 27 | 29 Min | | | | | | |
| 28 | 34 Min | | | | | | Start 7:14 3rd 176.8' Stem & DH Assy w/H2O Stop 8:30 @408.9 BOH |
| 29 | 18 Min | | | | | | |
| | 12 Min | | | | | | |
| 408.8 | | | Bottom of Hole | | | | Bottom of Rock Socket |

| | | | |
|---|--|---|--|
| Norfolk Lake Bridges | | 1023 Smith Rock | |
| 62-P7-S-Socket | | Elevation of Bottom of Hole 408.9' | |
| Robert Schmoker | | Steven M. Hains | |
| Don Uchtman | | Casing Record Depth 432.0 Type 1/2" | |
| Don Uchtman | | TOTAL NUMBER CORE BOXES 0 | |
| Direction of Hole <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | ELEVATION of Water Varies 542.31 | |
| Boring Method: Reverse Rotary | | DATE HOLE STARTED 9/5/80 COMPLETED 9/9/80 | |
| DEPTH DRILLED INTO ROCK 23.8 | | ELEVATION TOP OF HOLE 555.33 T.O. Platform | |
| TOTAL DEPTH OF HOLE 27.0 | | TOTAL CORE RECOVERY FOR BORING 435.9 T.O. Grop | |
| | | SIGNATURE OF INSPECTOR 432.7 T.O. Rock 553.5 T.O. Can | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|-------------|---|------------|-------------|--------------|--|
| 435.9 | | 10 Min | CEMENT GROUT | | | | Start 12:25 1st gear 7rpm 186.6' Stem & DH Assy w/H2O off |
| | 1 | 45 Min | | | | | Stop 1:45 Stem Adj and H2O off |
| | 2 | 15 Min | | | | | Start 2:15 2nd gear 17rpm @2:16 H2O on |
| | 3 | 2 Hr 15 Min | Top of Rock | | Milky | Smooth | Stop 4:20 @4.0 |
| 432.7 | | | | | | | Avg. Top of Rock |
| 432.0 | 4 | 1 Hr 19 Min | DOLOMITE | | | | Bottom of Casing |
| | 5 | 1 Hr 35 Min | | | | | Start 8:26 @4.0 2nd gear 17rpm w/H2O 1186.6 Stem & DH Assy @9:10 1st gear 7rpm (rough action) 2nd gear @9:25 3rd gear @3:00 @8.7 28rpm Stop 3:15 @10.0 |
| | 6 | 1 Hr 2 Min | | | | | |
| 428.9 | 7 | 53 Min | | | | | Avg. Top of Rock Socket |
| | 8 | 58 Min | | | | | |
| | 9 | 1 Hr 2 Min | | | | | |
| | 10 | | | | | | |

| ELEVATION | | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--|--------|------------|--|------------|-------------|--------------|--|
| 425.9 | | | | | | | | |
| | | 1 Hr | | Dolomite - Mod Hard Buff - Grey | | | | Start @10.0 7:45 gear w/H2O 186.6 Stem & DH Assy 17rpm 3rd gear 26rpm @10.8- 8:50 Stop 1:32 Mark kelly Start 1:35 |
| | | 15 Min | | | | | | |
| | | 35 Min | | | | | | |
| | | 30 Min | | | | | | |
| | | 35 Min | | @ 13.5 Thin shale seam - .05' w/pyrite crystals | | | | |
| | | 25 Min | | @ 13.6 Dolomite - Grey - Mod Hard | | | | |
| | | 32 Min | | | | | | |
| | | 28 Min | | | | | | |
| | | 30 Min | | | | | | |
| | | 30 Min | | | | | | |
| | | 27 Min | | | | | | |

| | | | | | | | |
|---|--|-------------------|--|--|--|------|--|
| DRILLING LOG | | DACW 03-79-C-1000 | | MUSEMAN Construction Co. | | 1013 | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 LOCATION 62-P7-S-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO. | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT. | | | | 16 DATE MOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|--|
| | 20 Min | | Dolomite - Buff & Grey Mod Hard - w/numerous healed fractures in buff | | | | |
| 21 | 16 Min | | @ 21.3 - .05' TK seam filled with calcite crystals & pyrite shale | | | | |
| 22 | 29 Min | | @ 21.35 - 21.9 - Chert - Grey - dark grey - hard | | | | |
| 23 | 32 Min | | @ 21.9 - Dolomite - Grey & Buff - Mod Hard | | Milky | Smooth | |
| 24 | 30 Min | | | | | | |
| 25 | 31 Min | | | | | | |
| 26 | | | | | | | Start 7:13 3rd gear 26rpm w/H2O 186.6 Stem & DH Assy Stop 7:44BOR |
| 408.9 | 27 | | Bottom of Hole | | | | Bottom of Rock Socket |

062

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | |
|--|--------|----------------------------------|---|--|-------------|-----------------------------------|--|
| PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT 102" Smith - Rock | | | |
| 1. LOCATION 62-P8-N-Socket | | | | 11. Elevation of Bottom of Hole 405.8' | | | |
| 2. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 3. HOLE NO. | | | | 13. Casing Record | | Depth 121.0' Type 10.0' OD | |
| 4. NAME OF DRILLER Don Uchtman | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 5. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15. ELEVATION of Water 544.97 | | | |
| 6. Boring Method: Reverse Rotary | | | | 16. DATE HOLE | | STARTED 3/20/81 COMPLETED 3/23/81 | |
| 7. DEPTH DRILLED INTO ROCK 24.4 | | | | 17. ELEVATION TOP OF HOLE 553.24 TOP | | | |
| 8. TOTAL DEPTH OF HOLE 27.72 | | | | 18. TOTAL CORE RECOVERY FOR BORING 433.52 TOG | | | |
| | | | | 19. SIGNATURE OF INSPECTOR (Drill) 430.2 TOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 433.52 | | | | | | | 3/20/81 |
| | 17 min | | CLAY & MUD | | | | Start 3:10 1st 7rpm w/H2O 186.3' Stem - Kelly & D&H Assy Stop 4:15 |
| | 27 min | | CEMENT GROUT | | | | |
| 430.52 | 21 min | | CLAY & MUD | | | | 3/20/81 |
| 430.20 | 1hr | | Average Top of Rock | | | | 3/21/81 |
| | 21min | | Dolomite - Buff - Grey Mod Hard - Hard-Siliceous | | | | Start 7:35 1st 7rpm w/H2O 186.3' Stem Kelly & dh Assy @3.3 2nd 17rpm 3.4 4th 27rpm |
| | 49 min | | 4.4 Dolomite - Brown - Hard Silic | | | | |
| | 55 min | | 5.4 Dolomite - Highly Siliceous Brown - Grey - Hard - Slightly Fractured | | | | |
| | 52 min | | 5.7 Dolomite - Light Grey - Mod Hard | | Milky Brown | Smooth | |
| | 38 min | | | | | | |
| | 42 min | | | | | | |
| | 41 min | | 8.9 - 8.95 Shale Seam - Black - Soft 3.95 Dolomite - Dark Grey - Hard - Silic | | Grey | Rough | |
| 423.52 | | | | | Milky | Smooth | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Hassman Construction Co. | | SHEET 2 OF 3 SHEETS | |
|---|--------|----------------------------------|--|--|-------------|------------------------|--|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 62-P8-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO. | | | | 13 Casing Record Depth Type | | | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method: Rotary | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| (Drill) | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 423.52 | 10 | | | | | | |
| | 39 min | | Dolomite - Dark Grey - Silic - Mod Hard - Hard 10.6 - 10.65 | | Milky | Smooth | 4th 27rpm w/H2O 186.3' Stem - Kelly & DH Assy |
| | 11 | | Shale Stem - Black - Soft 10.65 | | Grey | Rough | Stop 3:16 @12.6 |
| | 40 min | | Dolomite - Grey - Hard Silic | | | | |
| | 12 | | | | | | |
| 419.92 | 41 min | | 12.3 - 12.5 Shale - Black - Soft 12.5 | | | | 3/21/81 |
| | 13 | | Dolomite - Grey - Hard Silic 13.1 | | Milky | Smooth | 3/23/81 |
| | 40 min | | Dolomite - Dark Grey - Mod Hard 13.8 | | | | Start 7:30 4th 27rpm w/H2O 186.3' Stem - Kelly DH Assembly |
| | 14 | | Dolomite - Brown - Hard Silic | | | | |
| | 31 min | | 14.6 - 14.8 Clay filled cavern (Est. less than 1/4 hole) 14.8 | | | | |
| | 15 | | Dolomite - Light Buff Hard - Silic Fractures with Iron Stains | | Muddy | Rough | |
| | 28 min | | | | | | |
| | 16 | | | | | | |
| | 39 min | | 16.6 Light Dolomite - Buff - Mod Hard Hard-Sly. Silic-Sly.Frac. 17.1 | | | | |
| | 17 | | Dolomite - Grey - Mod Hard | | | Smooth | |
| | 30 min | | | | Milky | | |
| | 18 | | | | | | |
| | 38 min | | 18.4 Dolomite - Grey - Mod Hard - Hard - Slightly Silic | | | | |
| | 19 | | | | | | |
| | 27 min | | 19.2 Dolomite - Dark Grey Mod Hard | | | | |
| 413.52 | 20 | | | | | | |

064

| | | | | | | | |
|--|--|----------------------------------|--|---|--|------------------------|-----------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 of 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 62-P8-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 1 GEOTECHNICIAN | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO | | | | 13 Casing Record | | Depth | Type |
| 3 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BORES | | | |
| 4 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | STARTED | COMPLETED |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR (Drill) | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|---|
| 413.52 | 20 | | | | | | |
| | 28 min | | Dolomite - Dark Grey - Mod Hard | | | | 4th 27rpm w/H20 186.3 Stem Kelly & DH Assy Stop 3:00 BOH |
| | 21 | | | | | | |
| | 31 min | | | | Milky | | |
| | 22 | | | | | | |
| | 26 min | | 22.6 - 22.9 Shale Seam - Black - Soft | | Grey | | |
| | 23 | | 22.9 Dolomite - Buff - Mod Hard - Slightly Frac. | | | Smooth | |
| | 30 min | | | | Milky Brown | | |
| | 24 | | | | | | |
| | 30 min | | 24.6 Dolomite - Brown - Hard Very Hard - Highly Siliceous | | Milky | | |
| | 25 | | | | | | |
| | 27 min | | 25.6 Dolomite - Buff - Mod Hard - Fractures | | Milky Brown | | |
| | 26 | | | | | | |
| | 22 min | | 26.5 Dolomite - Grey - Mod Hard - Weathered with Iron Stains | | Milky | | Design Bottom of Rock Socket 406.8 |
| 405.3' | 6 min | | Bottom of Rock Socket | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0015 | | Contractor: Massman Construction Co. | | Sheet 1 of 4 SHEETS | |
|---|-------|----------------------------------|--|---|----------------|-----------------------------------|--|
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 62-P8-S-Socket | | | | 11 Elevation of Bottom of Hole 405.7' | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| HOLE NO | | | | 13 Casing Record | | Depth 121.0 Type 10' OD | |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 ELEVATION of Water 544.79 | | 16 DATE HOLE 3/14/81 | |
| Boring Method: Reverse Rotary | | | | 17 ELEVATION TOP OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | |
| DEPTH DRILLED INTO ROCK 28.8' | | | | 19 SIGNATURE OF INSPECTOR | | | |
| TOTAL DEPTH OF HOLE 31.65' | | | | (Drill) | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | CEMENT Loss | Water Color | Water Action | REMARKS |
| 437.35 | | 50 min | CEMENT GROUT | | | | Start 2:16 1st 7rpm w/H2O 186.3 Stem Kelly & DH Assy Stop 3:15 @1.5 |
| 435.86 | 1 | 21 min | CLAY MUD | | Muddy | Rough | |
| 434.5' | 2 | 33 min | | | | | 3/16/81 Start 1st 7rpm w/H2O 186.3 Stem Kelly & DH Assy @7.5 - 2.8 2nd 17rpm Stop 8:15 Grease Swivel Weld Stem bolt lugs. Start 9:30 4th 27rpm @9.30 1st 7rpm 6.7 - 7.0 @7.0 4th 27rpm Stop 2:33 Crane Repair Start 2:55 |
| | 3 | 54 min | Average Top of Rock Dolomite - Brown - Mod Hard - Hard - Slightly Silic 3.2 | | | | |
| | 4 | 44 min | Dolomite - Grey - Hard Silic 3.9 Dolomite - Grey - Mod Hard - Slightly Frac. 4.8 | | | | |
| | 5 | 47 min | Dolomite - Grey - Brown Mod Hard - Hard - Slightly Silic | Milky | | Smooth | |
| | 6 | 46 min | 6.7-7.0 Clay filled cavern - Red (Est. 1/8 of hole) 7.0 | | | | |
| | 7 | 40 min | Dolomite - Grey - Brown Hard Silic 7.4 | | Red | Rough | |
| | 8 | 1hr 1min | Dolomite - Grey - Brown Hard - Silic - Fractured (Brown clay filled frac) 8.2 Dolomite - Grey - Mod Hard 8.4 | Muddy | | | |
| | 9 | 49 min | Dolomite - Grey - Hard Silic 9.8 Shale Seam - Black - Soft 9.9 Dolomite - Grey - Hard Silic | | | Smooth | |
| 427.35 | 10 | | | | Milky | | |

066

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|--|--------|----------------------------------|---|---|-------------|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Messman Construction Co. | | SHEET 2 OF 4 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 62-P8-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method: Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| (Drill) | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 427.35 | 10 | | | | | | |
| | 50 min | | Dolomite - Grey - Hard Silic 10.2 | | | | 4th 27rpm w/H2O 186 3' Stem - Kelly & DH Ass |
| 426.25 | 11 | | Dolomite - Light Grey - Mod Hard | | | | Stop 4:15 @11 |
| | 34 min | | | | | | 3/16/81 |
| | 12 | | | | | | 3/17/81 |
| | 39 min | | 12.2 Dolomite - Brown - Mod Hard | | Milky | | Start 7:43 4th 27rpm w/H2O 186 3' Stem - Kelly & DH Ass |
| | 13 | | | | | | |
| | 43 min | | 13.5 Dolomite - Grey - Mod Hard | | | | |
| | 14 | | | | | | |
| | 44 min | | 14.9 Shale - Black - Soft | | | Smooth | |
| | 15 | | 15.0 Dolomite - Grey - Mod Hard | | Grey | | |
| | 39 min | | 15.4 - 15.45 Shale - Black - Soft | | | | |
| | 16 | | 15.45 Dolomite - Grey - Mod Hard - Hard - Slightly Silic | | Milky | | |
| | 39 min | | 16.7 Shale Pod (Est 1/3 of hole) Black - Soft - Pyritic | | | | |
| | 17 | | 17.1 Dolomite - Grey - Hard Silic | | Grey | | |
| | 42 min | | | | | | |
| | 18 | | 18.2 Dolomite - Brown - Hard Highly Siliceous | | Milky | | |
| | 40 min | | 19.1 - 19.4 Chert - Black - Hard | | | | |
| | 19 | | 19.4 Dolomite - Grey - Very Hard - Highly Siliceous | | | | |
| | 39 min | | | | | | |
| 417.35 | 20 | | | | | | |

067

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|---|--------------|---|--|---|--------------------|-------------------------------|---|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 4 SHEETS | |
| LOCATION Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 62-P8-S-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 1 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO. | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |
| (Drill) | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 417.35 | 20 | | Dolomite - Grey - Hard | | | | 4th 27rpm w/H2O 186 3 Stem Kelly & DH Ass Stop 3:15 @23.4 |
| | 52 min | | Very Hard | | | | |
| | 21 | | 20.1 - 20.15 Highly Siliceous | | | | |
| | | | Shale - Black - Soft | | | | |
| | 47 min | | 20.15 | | | | |
| | 22 | | Dolomite - Grey - Hard | | | | |
| | | | Silic - Slightly Frac. | | | | |
| | 37 min | | 20.9 | | | | |
| | 23 | | Dolomite - Light Grey | | | | |
| | | | Mod Hard - Hard - Slightly Silic | | | | |
| | 36 min | | 21.8 | | | | 3/17/81 3/18/81 Start 7:35 4th 27rpm w/H2O 186.3 Stem - Kelly & DH Ass |
| 413.95 | 24 | | 23.8 | | | | |
| | 44 min | | Dolomite - Dark Grey - Mod Hard | | | | |
| | 25 | | | | | | |
| | 39 min | | | | | | |
| | 26 | | | | | | |
| | 37 min | | | | | | |
| | 27 | | 27.2 | | | | |
| | 39 min | | Dolomite - Grey - Dark Grey - Mod Hard - Hard Slightly Silic | | | | |
| | 28 | | 27.6 - 27.7 | | | | |
| | 37 min | | Weathered Dolomite - Pod - White - Soft | | | | 068 |
| | 29 | | 27.7 | | | | |
| | 22 min | | Dolomite - Dark Grey Mod Hard | | | | |
| | | | 29.4 | | | | |
| | | | Dolomite - Buff - Mod Hard - Fractures | | | | |
| | | | 29.6 | | | | |
| | | | Dolomite - Grey - Mod Hard | | | | |

| | | | | | | | |
|---|--|---|--|---|--|-------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 4 OF 4 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P8-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth Type | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING % | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 407.35 | 30 | 32 min | Dolomite - Grey - Mod Hard 30.6 | | Milky | Smooth | 4th 27rpm w/H2O 186.3 Stem Kelly & DH Assy Stop 12:09 BOH |
| | 31 | | Dolomite - Buff - Grey Mod Hard - Slightly Fractured | | | | |
| 405.7 | | 2 min | Bottom of Rock Socket | | | | Design Bottom of Rock Socket 406.8 |

069

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 1 of 3 sheets | |
|--|--------|----------------------------------|---|---|-------------|------------------------|---|
| Norfolk Lake Bridges | | | | 10 1/2" Smith Rock | | | |
| LOCATION 62-P9-N-Socket | | | | Elevation of Bottom of Hole 403.07 | | | |
| Geotechnician Robert Schmoker | | | | MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain | | | |
| HOLE NO. | | | | Casing Record | | Depth 120' | Type 10' O.D. |
| NAME OF DRILLER Dom Uchtman | | | | TOTAL NUMBER CORE BORES | | | |
| DIRECTION OF HOLE (X) VERTICAL () INCLINED _____ DEG FROM VERT | | | | ELEVATION of Water Various 540.55 | | | |
| Boring Method: Reverse Rotary | | | | DATE HOLE | | STARTED 10/21/80 | COMPLETED 10/23/80 |
| DEPTH DRILLED INTO ROCK 26.23 | | | | ELEVATION TOP OF HOLE 550.53 Platform | | | |
| TOTAL DEPTH OF HOLE 28.34 | | | | TOTAL CORE RECOVERY FOR BORING 429.3 TOR | | | |
| | | | | SIGNATURE OF INSPECTOR 431.41 TOG | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 431.41 | 20 Min | 1 Hr 5 Min | CEMENT GROUT | | Muddy | Rough | 10/21/80 Start 9:35 1st Gear w/H2O 186.2 Stem & DH Assy. 7rpm @10:30 2nd w/H2O 17rpm 1.3 3rd @11:40 2.1 27rpm Stop 12:00 H2O Loss |
| 429.3 | 2 | 1 Hr 13 Min | Top of Rock DOLOMITE - Grey - Dark Grey Hard - Very Hard - Highly siliceous - massive | | Milky | | Start 1:50 3rd 27rpm w/H2O Stop 3:35 @5.5 Weld lugs on Stem |
| | 3 | 44 Min | @ 3.3 Dolomite - Buff - Mod Hard - Sandy - w/Pink Chert nodules | | | | |
| | 4 | | @ 3.7 Dolomite - Buff - Mod Hard - weathered | | | | |
| | 5 | 25 Min | @ 4.4 Dolomite - Grey - Mod Hard - Hard - very slightly fractured | | | Smooth | |
| | 6 | 43 Min | @ 4.9 Dolomite - Buff - Grey Mod Hard | | | | |
| 429.91 | 7 | 48 Min | @ 5.4 Dolomite - Grey - Mod Hard - Hard - w/grey chert nodules | | | | 10/22/80 Start 7:25 186.2' Stem & DH Assy. 3rd 2' with H2O Stop 7:45 @6.0' Table Check Start 7:52 Stop 9:02 Table Check Start 9:07 |
| | 8 | 42 Min | @ 5.9 Dolomite - Grey - Mod Hard - Slightly Fractured | | | | |
| | 9 | 49 Min | @ 7.6 Dolomite - Grey - Mod Hard - Hard | | Grey | Rough | |
| | 10 | 44 Min | @ 8.3 Shale - Black - soft - @ 8.5 Dolomite - Buff - Grey Mod Hard - Slightly Frac @ 8.8 Dolomite - Light grey Mod Hard - Massive | | Milky | Smooth | 070 |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 2 of 3 sheets | |
| Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 62-P9-N-Socket | | | | 11. MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 1. Geotechnician | | | | 12. Casing Record Depth Type | | | |
| 2. HOLE NO. | | | | 13. TOTAL NUMBER CORE BOXES | | | |
| 3. NAME OF DRILLER | | | | 14. ELEVATION of Water | | | |
| 4. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15. DATE MOLE STARTED COMPLETED | | | |
| 7. Boring Method: Rotary | | | | 17. ELEVATION TOP OF MOLE | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 19. SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|--|------------|-------------|--------------|--|
| 421.41 | 10 | | | | | | |
| | 40 Min | | DOLOMITE - Light Grey - Mod Hard - Massive | | | | 186.2' Stem & Down Hole Assembl |
| | 11 | | @ 10.9 - 11.0 Shale seam - Black - Soft | | | | 3rd 27rpm w/H2O |
| | 35 Min | | Dolomite - Mod Hard - Buff - Grey - Slightly Fractured | | | | Stop 12:43 |
| | 12 | | @ 12.2 Dolomite - Mod Hard - Grey | | | | Grease Kelly |
| | 32 Min | | @ 12.9 - 13.0 Shale - Black - Soft | | | | Start 1:11 |
| | 13 | | @ 13 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | Stop 2:09 |
| | 35 Min | | @ 13.8 Dolomite - Buff - Grey - Mod Hard | | | | Broken H2O Hose |
| | 14 | | | | | | Start 3:23 |
| | 31 Min | | | | | | Stop 4:15 |
| | 15 | | @ 15.6 Dolomite - Buff - Mod Hard - Frac | | | | |
| | 30 Min | | | | | | |
| 415.41 | 16 | | | | | | |
| | 36 Min | | | | | | |
| | 17 | | @ 17.2 Chert - brown - Grey | | | | 10/23/80 |
| | 18 Min | | Small Cavern - approx. 1/8 of hole - Siltstone filled @ bottom 17.8 - 18.1 | | | | Start 8:11 |
| | 18 | | @ 18.1 Dolomite - Buff - Mod Hard - intense frac - Extreme weathering on fractures | | | | 186.2' Stem & DH Assy. 27rpm w/H2O 3rd |
| | 38 Min | | @ 18.6 Dolomite - Buff - Mod hard - slightly fractured | | | | 1st Gear @ 8:55 |
| | 19 | | | | | | (Rough Drilling in cavern area) |
| | 33 Min | | | | | | 17.2 - 18.1 |
| | 20 | | | | | | 3rd Gear @ 18.2 @ 9:10 |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P9-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 20 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|--|
| 411.41 | 20 | | | | | | |
| | 30 Min | | DOLOMITE - Mod Hard - Buff - Slightly Fractured | | | | 186.2' Stem & Down Hole Assy 3rd w/ H2O 27 rpm Stop 1:41 BOH |
| | 21 | | | | | | |
| | 29 Min | | | | | | |
| | 22 | | @ 22.1 Dolomite - Mod Hard Grey - Massive | | | | |
| | 27 Min | | @ 22.5 - 22.6 Shale Seam - Black - Soft | | | | |
| | 23 | | @ 22.6 Dolomite - Grey - Mod Hard | | | | |
| | 34 Min | | | | | | |
| | 24 | | | | | | |
| | 29 Min | | | | | | |
| | 25 | | | | | | |
| | 24 Min | | @ 25.8 - 25.85 Shale Seam Black - Soft | | | | |
| | 26 | | @ 25.85 Dolomite - Grey - Mod Hard | | | | |
| | 27 Min | | @ 27.15 - 27.2 - Shale - Black - Soft | | | | |
| | 27 | | @ 27.2 Chert - Brown - Hard | | | | |
| | | | | | | | Design Bottom of Rock Socket 404.2 |
| 403.07 | | | Bottom of Hole | | | | |

072

| | | | | | | | |
|--|--|------------------------------|--|--|--|----------------------------|--|
| SPILLING LOG | | PROJECT NO. DAC 03-74-C-0055 | | CONTRACTOR Massman Construction Co. | | LOT 3 | |
| Norfolk Lake Bridges | | | | 10" Smith Rock | | | |
| LOCATION 62-P9-S-Socket | | | | Elevation of Bottom of Hole 403.14 | | | |
| Geotechnician Robert Schmoker | | | | MANUFACTURER'S DESIGNATION OF DRILL Steven M. Main | | | |
| HOLE NO | | | | Casing Record | | Depth 120.0' Type 10' O.D. | |
| NAME OF DRILLER Don Uchtman | | | | TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | ELEVATION of Water Various 540.87 | | | |
| Boring Method: Reverse Rotary | | | | DATE HOLE | | 10/28/80 10/30/80 | |
| DEPTH DRILLED INTO ROCK 25.16 | | | | ELEVATION TOP OF HOLE 549.33 Platform | | | |
| TOTAL DEPTH OF HOLE 26.99 | | | | TOTAL CORE RECOVERY FOR BORING 430.13 TOG | | | |
| | | | | SIGNATURE OF INSPECTOR 428.3 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------------|------------|--|------------|-------------|--------------|---|
| 430.13 | | | | | | | |
| | 15 Min | | CEMENT GROUT | | Grey | | 10/28/80 Start 2:10 186.2' Stem & DH Assy 1st 7rpm No H2O H2O on @ 3:06 @1.2 @3:12 1.3' 2nd 17rpm @2' 1st 7rpm |
| 428.3 | 55 Min | | Average Top of Rock | | Milky | | (Rough Drill Action-Extremely Frac. Rock) @4:00 3.1' H2O Stop 4:12 |
| | 25 Min | | DOLOMITE - Buff Grey-Mod Hard-w/Fe stains on frac planes - very fractured | | | | |
| 427.03 | | | Chert - brown | | | | 10/29/80 Start 7:40 2nd 17rpm No H2O 186.2' Stem & DH Assy. H2O @ 7:50 @3.4 3rd 27rpm @ 7:55 Stop 9:55 Weld lugs on Stem Start 9:15 |
| | 1 Hr 17 Min | | Dolomite - Buff- Mod Hard Slightly Frac - FE stained Dolomite - Mod Hard - Grey | | | | |
| | 30 Min | | Chert Dolomite - Grey - Mod Hard Dolomite - Buff - w/healed frac - Fe stained - Mod Hard | | | | |
| | 40 Min | | Dolomite - Mod Hard - Grey - Buff | | | | |
| | 50 Min | | | | | | |
| | 45 Min | | ESTIMATE: Decomposed limestone pod 1/8 of hole .1' thick | | | | |
| | 45 Min | | Dolomite - Mod Hard - Grey - Buff | | | | |
| | 40 Min | | @9.8 Dolomite - Buff - Grey Vuggy w/Calcite filled Vugs | | | | |

| | | | | | | | |
|---|--|----------------------------------|--|---|--|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 62-P9-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO | | | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water | | | |
| Boring Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|--------|------------|--|------------|-------------|--------------|---|
| 420.13 | 10 | | | | | | |
| | 40 Min | | Dolomite - Buff - Grey Vuggy - w/calcite filled vugs | | | | 3rd 27rpm w/H2O 186.2' Stem & DH Assy. |
| | 11 | | @ 10.2 Dolomite - Brown - Grey - Mod Hard - Hard - Siliceous | | | | 2nd 2:05 - 2:10 Rough Action in Decomposed l.s. |
| | 40 Min | | @ 10.8 to 10.85 & 11.3 - 11.35 Shale - Black - soft | | | | 3rd @2:10 Stop 3:00 @13.1 |
| | 12 | | @ 10.85 Dolomite - Buff - Grey - Mod Hard - Hard - Slightly siliceous - Slightly fractured | | | | |
| | 40 Min | | @ 11.7 - 11.75 Decomposed Limestone | | | | |
| 417.03 | 13 | | @ 11.75 Dolomite - buff - grey - Mod Hard - slightly fractured | | | | |
| | 34 Min | | @ 13.6 Dolomite - Buff - Mod Hard - Fractured | | | | 10/30/80 Start 7:31 |
| | 14 | | @ 14.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | 3rd 27rpm w/H2O 186.2' Stem & DH Assy. |
| | 38 Min | | @ 15.7 - 15.9 - Claystone - Brown - Soft | | | | Stop 8:22 @14.5 Swivel Check |
| | 15 | | @ 15.9 - 16.0 - Shale - Black - soft | | | | Start 8:32 |
| | 37 Min | | @ 16.1 Dolomite - Grey - Buff - Mod Hard - Slightly Fractured | | | | 11:25 1st Cavern |
| | 16 | | | | | | |
| | 30 Min | | | | | | |
| | 17 | | @ 17.4 to 17.5 Decomposed limestone seam soft | | | | |
| | 30 Min | | @ 17.5 - Dolomite - Buff - Mod Hard - Slightly Frac | | | | |
| | 18 | | | | | | |
| | 30 Min | | @ 19.1 - 19.3 Small cavern Calcite crystals | | | | |
| | 19 | | @ 19.3 Dolomite - Buff - Grey - Mod Hard - Slightly Fractured | | | | |
| | 30 Min | | @ 19.8 Small Cavern | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|----------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
| 1. LOCATION Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT | | | |
| 2. LOCATION 62-P9-S-Socket | | | | 11. Elevation of Bottom of Hole | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4. HOLE NO. | | | | 13. Casing Record | | Depth Type | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15. ELEVATION of Water | | | |
| 7. Boring Method: Rotary | | | | 16. DATE HOLE | | 17. ELEVATION TOP OF HOLE | |
| 8. DEPTH DRILLED INTO ROCK | | | | 18. TOTAL CORE RECOVERY FOR BORING | | 19. SIGNATURE OF INSPECTOR | |
| 9. TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 410.13 | 20 | | | | | | |
| | 21 | 30 Min | Cavern - Cont. 19.8 - 21.1 Approximately 1.8 of hole in Dolomite - Grey - Mod Hard | | | | 186.2' Stem & DH Assy 1st 7rpm H2O Off @ 11:45 On at 11:52 Rough Drill |
| | 22 | 38 Min | @ 21.1 Chert - Brown - Milky - Hard | | | | Action in Cavern @21.1 2nd 17rpm 3rd @ 12:45 @22.2' 27rpm Stop 2:43 BQH |
| | 23 | 47 Min | DOLOMITE - Buff - Mod Hard - Fractured | | | | |
| | 24 | 30 Min | | | | | |
| | 25 | 23 Min | @ 25.5 Dolomite - Grey - Mod Hard | | | | |
| | 26 | 30 Min | @ 25.85 - 25.9 - Shale - Black - Soft | | | | |
| | 27 | 30 Min | @ 25.9 - Dolomite - Grey - Mod Hard | | | | |
| | | | Actual Bottom of Hole 403.14 | | | | Design Bottom of Rock Socket 404.2 |

| DRILLING LOG | | PROJECT NO. DAC 03-79-C-0055 | | CONTRACTOR: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | |
|---|-------|---------------------------------|---|---|-------------|-------------------------------------|--|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 1 LOCATION 62-P10-N-Socket | | | | 11 Elevation of Bottom of Hole 403.2 | | | |
| 2 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 3 HOLE NO | | | | 13 Casing Record | | Depth 128.5' Type 10 OD | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 546.28 | | | |
| 7 Boring Method: Reverse Rotary | | | | 16 DATE HOLE | | STARTED 4/2/81 COMPLETED 4/5/81 | |
| 8 DEPTH DRILLED INTO ROCK 25.2 | | | | 17 ELEVATION TOP OF HOLE 557.74 TOP | | | |
| 9 TOTAL DEPTH OF HOLE 28.69 | | | | 18 TOTAL CORE RECOVERY FOR BORING 431.89 TOG | | 19 SIGNATURE OF INSPECTOR 428.4 TOR | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 431.89 | | 5min | SAND | | | | Start 12:44 1st 7rpm w/H2O 186.3 Stem Kelly & DH Assembly @ 4.0 - 2:09 4th 27rpm Stop 4:15 @ 5.5 |
| | 1 | | | | | | |
| | 2 | 36min | CEMENT GROUT | | Muddy | Smooth | |
| | 3 | 6 min | CLAY AND MUD | | | | |
| 428.4' | 4 | 28 min | Average Top of Rock Dolomite - Grey - Hard Highly Siliceous | | | Rough | |
| | 5 | 1 hr. 51 min | | | | | |
| 426.39 | 6 | 50 min | 5.2 Dolomite - Grey - Mod Hard | | | | 4/2/81 4/3/81 Start 7:31 4th 27 rpm w/H2O 186.3 Stem Kelly DH Assembly |
| | 7 | 40 min | 5.9 - 5.95 Shale Seam - Black - Soft | | | | |
| | 8 | 38 min | 5.95 Dolomite - Grey - Hard - Siliceous 6.7 Dolomite - Grey - Brown Hard Highly Siliceous | | Milky | Smooth | |
| | 9 | 34 min | 7.9 Dolomite - Light Grey - Mod Hard | | | | |
| 421.89 | | 34 min | | | | | |

076

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
|--|-------|----------------------------------|---|---|-------------|------------------------|--|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P10-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 20 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 421.89 | 10 | | | | | | |
| | 11 | 34 min | Dolomite - Light Grey - Mod Hard 10.4 Dolomite - Grey - Mod Hard Hard - Slightly Silic 10.8 Dolomite - Grey - Mod Hard | | | | 4th 27rpm W/H2O 186.3 Stem Kelly & DH Assy @2:45 1st 7rpm (cavern) @18.3' 4th 27rpm Stop 4:18 @ 18.5' |
| | 12 | 31 min | | | | | |
| | 13 | 41 min | 12.6 - 12.8 Dolomite - Grey - Mod Hard Vuggy - Filled with Pink Calcite crystals 12.8 Dolomite - Buff - Grey - Mod Hard 13.0 - 13.1 Shale Seam - Black - Soft 13.1 Dolomite - Grey - Mod Hard | | | | |
| | 14 | 30 min | | | Milky | Smooth | |
| | 15 | 31 min | | | | | |
| | 16 | 41 min | 15.2 Dolomite - Buff - Grey - Mod Hard 15.9 Dolomite - Buff - Slightly Fractured - Mod Hard | | | | |
| | 17 | 36 min | 16.8 Dolomite - Brown - Hard Silic | | | | |
| | 18 | 49 min | 17.6 - 18.3 Cavern (Est. Less than 1/3 of hole in above Dolomite) | | | Very Rough | |
| 413.39 | 19 | 1 hr. 25 min | 18.6 Dolomite - Brown - Mod Hard Hard Slightly Silic - Slightly Fractured 19.2 Dolomite - Buff - Mod Hard - Slightly Fractured | | | Smooth | 4/3/81 4/4/81 Start 7:35 4th 27 rpm w/H2O 186.3 Stem Kelly & DH Assembly |
| 411.89 | 20 | 33 min | | | | | 077 |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 1 LOCATION 62-P-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 2 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 4 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 7 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 8 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|--|
| 411.89 | 20 | | Dolomite - Buff - Mod Hard Slightly Fractured | | | | 4th 27rpm w/H2O 186.3 Stem Kelly & DH Assy Stop 12:11 BOH |
| | 21 | 33 min | | | | | |
| | 22 | 27 min | | | | | |
| | 23 | 29 min | 22.1 Dolomite - Dark Grey - Mod Hard - Massive | | | | |
| | 24 | 32 min | | | | | |
| | 25 | 31 min | | | | | |
| | 26 | 28 min | | | | | |
| | 27 | 22 min | 26.5 - 26.6 Shale Seam - Black - Soft 26.6 Dolomite - Grey - Mod Hard | | | | |
| | 28 | 19 min | 27.6 Dolomite - Buff - Grey Mod Hard | | | | Design Bottom of Rock Socket 404.5 |
| 403.20 | | | Bottom of Rock Socket | | | | |

078

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|---|--|----------------------------------|--|--|--|------------------------|---------------------|
| BORING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| H62-P10-S-Socket | | | | 11 Elevation of Bottom of Hole 403.5 | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M Hains | | | |
| HOLE NO | | | | 13 Casing Record | | Depth 128.5' | Type 10 OD |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEC FROM VERT | | | | 15 ELEVATION of Water 546.01 | | | |
| Boring Method: Reverse Rotary | | | | 16 DATE HOLE | | STARTED 3/30/81 | COMPLETED 4/1/81 |
| DEPTH DRILLED INTO ROCK 25.1 | | | | 17 ELEVATION TOP OF HOLE 558.15 TOP | | | |
| TOTAL DEPTH OF HOLE 29.05 | | | | 18 TOTAL CORE RECOVERY FOR BORING 432.55 TOG | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 428.6 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 432.55 | | | | | | | |
| | 5min | | SAND | | | Smooth | Start 1:15 186.3 Stem Kelly & DH Assy 1st 7rpm w/H2O @4.0' 4th 27rpm Stop 4:16 @5.0' |
| | 6min | | | | Muddy | | |
| | 44min | | CEMENT GROUT | | | | |
| | 51min | | CLAY - MUD | | | Rough | |
| 428.6' | | | Average Top of Rock | | | | |
| | 1 hr | | Dolomite - Grey - Hard - Silic - w/Chert Nodules | | | | |
| 427.55' | 15min | | 4.8 Dolomite - Grey - Mod Hard | | | | 3/30/81 |
| | 39min | | | | Milky | Smooth | 3/31/81 |
| | 1 hr | | 5.9 Dolomite - Sandy - Well rounded Qtz sand - Buff Mod Hard Dolomite | | | | Start 8:01 4th 27rpm w/H2O 186.3 Stem Kelly & DH Assy Stop 9:37 Tighten swivel packing Start 10:03 |
| | 46min | | 6.2 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic | | | | |
| | 46min | | 6.9 Dolomite - Grey - Hard - Silic | | | | |
| | 44min | | 8.4 Dolomite - Grey - Hard Silic w/Brown Chert Seams | | | | |
| | 46min | | 8.9 Dolomite - Grey - Hard - Silic | | | | |
| 422.55' | | | | | | | |

079

| | | | | | | | |
|--|--|----------------------------------|--|---|--|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 2 of 3 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| H62-P10-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | 13 Casing Record | | Depth | | Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE MOLE | | 17 ELEVATION TOP OF MOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------------|------------|---|------------|-------------|--------------|----------------------------|
| 422.55 | 10 | | con't | | | | |
| | 43min | | Dolomite - Grey - Hard - Silic @10.2 | | | | 4th 27rpm w/H2O |
| | 11 | | Dolomite - Light Grey - Mod Hard | | | | 186.3 Stem Kelly DH Assy |
| | 31min | | | | | | Stop 4:17 |
| | 12 | | | | Milky | | |
| | 34min | | 12.5 Dolomite - Brown - Mod Hard Massive | | | | |
| | 13 | | 13.1 Dolomite - Grey - Mod Hard | | | | |
| | 34min | | | | | | |
| | 14 | | | | | | |
| | 25min | | 14.8-14.95 Shale - Black - Soft | | | | |
| | 15 | | 14.95 Dolomite - Grey - Grey - Hard - Silic - Massive | | | Smooth | |
| | 15.5 - 15.6 | | Shale - Black - Soft | | Grey | | |
| | 27min | | 15.6 Dolomite - Grey - Mod Hard | | Milky | | |
| | 16 | | 16.7 - 16.8 Shale - Black - Soft | | Grey | | |
| | 31min | | 16.8 Dolomite - Grey - Mod Hard | | Milky | | |
| | 17 | | Hard - Slightly Silic | | Grey | | |
| 415.25 | | | | | | | |
| | 38min | | 17.6 Dolomite - Buff - Grey Mod Hard | | | | 3/31/81 |
| | 18 | | | | | | 4/1/81 |
| | 35min | | 18.7 Dolomite - Light Brown Hard Silic | | | | Start 8:00 |
| | 19 | | | | Milky | | 4th 27rpm W/H2O |
| | 29min | | 19.6 Dolomite - Light Brown Mod Hard | | | | 186.3 Stem Kelly & DH Assy |
| 412.55 | 20 | | | | | | |

080

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 of 3 SHEETS | |
|--|--|----------------------------------|--|---|--|------------------------|--|
| Norfolk Lake Bridges | | | | 10 SITE AND TYPE OF BIT | | | |
| LOCATION H62-P10-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 1 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BORES | | | |
| 2 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEC FROM VERT | | | | 15 Elevation of Water | | | |
| 3 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 STARTED COMPLETED | |
| 4 DEPTH DRILLED INTO ROCK | | | | 18 ELEVATION TOP OF HOLE | | | |
| 5 TOTAL DEPTH OF HOLE | | | | 19 TOTAL CORE RECOVERY PER BORING | | | |
| 6 SIGNATURE OF INSPECTOR | | | | 7 | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|---|
| 412.55 | 20 | | | | | | |
| | | 27min | Dolomite - Light Brown - Mod Hard 20.1 - 20.6 | | | Rough | 4th 27rpm w/H2O 186.3 Stem Kelly & DH Assy Stop 1:57 BOH |
| | 21 | | Dolomite - Grey - MOD Hard Hard with Grey Chert Nodules Vuggy 20.6 | | | | |
| | | 38min | Dolomite - Light Brown - Mod Hard - Slightly Frac with Iron Stains | | | | |
| | 22 | | | | | | |
| | | 41min | | | | | |
| | 23 | | 23.0 Dolomite - Buff - Grey - Mod Hard Buff with Frac with Iron Stains | | | | |
| | | 28min | | | | | |
| | 24 | | 24.2 Dolomite - Grey - Mod Hard | | Milky | Smooth | |
| | | 32min | | | | | |
| | 25 | | | | | | |
| | | 26min | | | | | |
| | 26 | | | | | | |
| | | 29min | | | | | |
| | 27 | | | | | | |
| | | 31min | 27.4 - 27.45 Shale Seam - Black - Soft 27.45 Dolomite - Grey - Mod Hard | | | | |
| | 28 | | | | | | Design Bottom of Rock Socket 404.5 |
| | | 17min | | | | | |
| 403.5' | 29 | | Bottom of Rock Socket | | | | |

081

| | | | | | |
|---|--|--|--|--------------------|----------------------|
| PROJECT LOG | | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Co. | | of 1 sheets |
| Location Norfolk Lake Bridges | | 10 Size and Type of Bit 102" Smith - Rock | | | |
| 62-P11-N-Socket | | Elevation of Bottom of Hole 405.8' | | | |
| Geotechnician Robert Schmoker | | 12 Manufacturer's Designation of Drill Steven Hains | | | |
| Hole No. | | 13 Casing Record | | Depth 120.0' | Type 10.0' OD |
| Name of Driller Don Uchtman | | 14 Total Number Core Boxes | | | |
| Direction of Hole <input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Inclined | | 15 Elevation of Water 543.62 | | | |
| Boring Method: Reverse Rotary | | 16 Date Hole | | Started 2/21/81 | Completed 2/24/81 |
| Depth Drilled into Rock 25.6' | | 17 Elevation Top of Hole 552.72' TOP | | | |
| Total Depth of Hole 27.33' | | 18 Total Core Recovery for Boring 432.33' TOG | | | |
| | | 19 Signature of Inspector 430.6' TOR | | | |

| Elevation | Depth | Drill Rate | Classification of Materials (Description) | Water Loss | Water Color | Drill Action | Remarks |
|-----------|-------|------------|--|------------|-------------|--------------|------------------|
| 432.33' | | | | | | | |
| | 1 | 37 min | MUD | | Muddy | Smooth | Start 9:33 |
| | | | CEMENT | | | | 186.3' stem - |
| | | | GROUT | | | | kelly & DH Assy |
| 430.6' | 2 | 39 min | Average Top of Rock | | | | 1st 7rpm w/H2O |
| | 3 | 39 min | Dolomite - Dark Grey - Hard - Siliceous with Chert Nodules | | | | @10:10 4th 27rpm |
| | | | 2.3 | | | | Stop 3:15 @8.1' |
| | 4 | 38 min | Dolomite - Buff - Grey Mod Hard | | | | |
| | | | 3.6 | | | | |
| | 5 | 48 min | Dolomite - Buff - Grey Mod Hard - Slightly Frac. | | Milky | Smooth | |
| | | | 3.8 | | | | |
| | 6 | 49 min | Dolomite - Buff - Grey Mod Hard | | | | |
| 426.0' | | | 4.3 | | | | |
| | 7 | 42 min | Dolomite - Grey - Hard Silic | | | | |
| | | | 6.9 | | | | |
| | 8 | 45 min | Shale - Black - Soft | | | | |
| 424.23' | | | 7.0 | | | | |
| | 9 | 38 min | Dolomite - Grey - Hard Silic | | | | |
| | | | 7.5 | | | | |
| | 10 | 48 min | Dolomite - Light grey Mod Hard | | | | |
| 422.33' | | | 9.4 | | | | |
| | | | Dolomite - Grey - Dark Grey - Mod Hard | | | | |

Top of Rock Socket

2/23/81
Start 7:27 @8.1
4th 27rpm w/H2O
186.3' stem -
kelly & DH Assy

082

| | | | | |
|---|--|---|---|--------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 2 of 3 |
| 1. PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT | | |
| 2. LOCATION 62-P11-N-Socket | | 11. Elevation of Bottom of Hole | | |
| 3. Geotechnician | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4. HOLE NO. | | 13. Casing Record Depth Type | | |
| 5. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15. ELEVATION of Water | | |
| 7. Boring Method: Rotary | | 16. DATE HOLE STARTED COMPLETED | | |
| 8. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | | |
| 9. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | | |
| | | 19. SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) (con't) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-----------|------------|--|------------|-------------|-----------------|--|
| | | | | | | | |
| | 40 min | | Dolomite - Grey - Dark Grey - Mod Hard | | Milky | Smooth | 4th 27rpm w/H2O 186.3' stem - Kelly & DH Assy |
| 11 | 39 min | | 11.6-11.8 Shale - Black - Soft | | Grey | Rough | |
| 12 | 11.8 | | Dolomite - Grey - Hard Silic | | Milky | Smooth | |
| | 35 min | | 12.1 Dolomite - Light Grey - Mod Hard | | Grey | Rough | |
| 13 | 12.4-12.5 | | Shale - Black - Soft | | Milky | | |
| | 32 min | | 12.5 Dolomite - Grey - Mod Hard | | Brown | | |
| 14 | 12.9 | | Dolomite - Buff - Mod Hard - Slightly Fractured | | | Smooth | |
| | 31 min | | 13.6-13.9 Dolomite - Buff - Mod Hard - Extremely Frac. with Iron Stains | | Milky Brown | | |
| 15 | 13.9 | | Dolomite - Buff - Mod Hard - Frac with Iron Stains | | | | |
| 16 | 23 min | | | | | | |
| | 22 min | | 16.6- 16.8 Chert - Grey - Hard | | | | |
| 17 | 16.8 | | Dolomite - Buff - Hard Siliceous - Slightly Fractured with Iron Stains | | | Rough | |
| | 39 min | | | | | | |
| 18 | | | | | Milky | Smooth | |
| | 39 min | | 18.2 Dolomite - Buff - Mod Hard fractures with Iron Stains | | | | |
| 19 | | | | | | | |
| | 32 min | | | | | | |
| 20 | | | | | | | |

412.33'

083

| | | | | | | | |
|---|-------|---|--|----------------------|-------------|--------|---|
| PROJECT NO. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | OF SHEETS: 3 of 3 | | | |
| 1. LOCATION Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | | | |
| 2. LOCATION 62-P11-N-Socket | | 11. ELEVATION OF BOTTOM OF HOLE | | | | | |
| 3. GEOREGISTRATION | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | | | | |
| 4. HOLE NO. | | 13. Casing Record | | Depth | Type | | |
| 5. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | | | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15. ELEVATION OF WATER | | | | | |
| 7. Boring Method: Rotary | | 16. DATE HOLE | | STARTED | COMPLETED | | |
| 8. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | | | | | |
| 9. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | | | | | |
| | | 19. SIGNATURE OF INSPECTOR | | | | | |
| Drill | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Action | REMARKS |
| 412.33' | 20 | | (con't) | | | | |
| | | 31 min | Dolomite - Buff - Mod Hard Fractures with Iron Stains | | | | 4th 27rpm w/H2O 186.3' stem - Kelly & DH Assy. Stop 4:45 @ 24.4' |
| | 21 | | 21.2 Dolomite - Buff - Grey Hard - Silic | | | | |
| | | 35 min | 21.3 Dolomite - Buff - Grey Mod Hard | | | | |
| | 22 | | | | Milky | Smooth | |
| | | 33 min | 22.5 Dolomite - Grey - Mod Hard - Slightly Silic | | | | |
| | 23 | | 23.2 Dolomite - Grey - Mod Hard | | | | |
| | | 31 min | | | | | |
| | 24 | | | | | | |
| 407.93' | | 39 min | | | | | 2/23/81 |
| | 25 | | 25.0-25.1 Shale - Black - Soft & Weathered - Dolomite White - Soft | | Grey | Rough | 2/24/81 Start 7:28 4th 27rpm w/H2O 186.3' stem - Kelly & DH Assy. |
| | | 23 min | 25.1 Dolomite - Buff - Grey Mod Hard - Slightly Fractured | | Milky Brown | Smooth | |
| | 26 | | | | | | |
| | | 24 min | | | | | |
| 405.0' | 27 | | | | | | Bottom of Rock Socket |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | |
|---|----------|----------------------------------|--|--|-------------|---|--------------------------------|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith - Rock | | | |
| 2 LOCATION 62-P11-S-Socket | | | | 11 Elevation of Bottom of Hole 404.8 | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven Hains | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth 120.0' Type 10.0' OD | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 543.41 | | | |
| 7 Boring Method: Reverse Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE 552.63' TOP | |
| 8 DEPTH DRILLED INTO ROCK 25.9' | | | | 18 DATE HOLE 2/17/81 | | 19 TOTAL CORE RECOVERY FOR BORING 433.93' TOG | |
| 9 TOTAL DEPTH OF HOLE 29.13' | | | | 19 SIGNATURE OF INSPECTOR | | 430.7' TOR | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 433.93' | | | | | | | |
| | 5 min | | SAND | | | | 2/17/81 |
| | | | AND | | | | Start 12.06 |
| | 1 | | | | | | 1st 7RPM w/H2O |
| | 34 min | | CEMENT | | | | 186.3' Stem-Kelly & D.H. Assy. |
| | | | GROUT | | | | @1:18 2nd 17RPM |
| | 2 | | | | | | @1:44 4th 27RPM |
| | 8 min | | Clay and Sand | | | | Stop 3:10 |
| 430.7' | | | Av. Top of Rock | | | | @5.4 |
| | 1hr 9min | | Dolomite - Grey - Hard | | | | |
| | | | Very Hard - Siliceous | | | | |
| | 4 | | 3.8 | | | | |
| | 46 min | | Dolomite - Buff - Grey | | | | |
| | | | Mod Hard | | | | |
| | 5 | | 4.6 | | | | |
| | 59 min | | Dolomite - Grey - Mod | | | | |
| | | | Hard - Hard - Slightly | | | | |
| | 6 | | Silic | | | | |
| 428.53' | | | | | | | 2/17/81 |
| | 5.8 | | Dolomite - Brown - | | | | |
| | | | Grey - Mod Hard | | | | |
| | 7 | | 6.5 | | | | |
| | 43 min | | Dolomite - Grey - Hard- | | | | |
| | | | Siliceous | | | | |
| | 8 | | 7.2 | | | | |
| | 37 min | | Dolomite - Grey - Mod | | | | |
| | | | Hard | | | | |
| 426.0' | | | | | | | 2/18/81 |
| | 52 min | | | | | | Start 7:37 |
| | | | | | | | 4th 27RPM with |
| | 9 | | | | | | H2O |
| | 42 min | | | | | | 186.3' Stem- |
| | | | | | | | Kelly & D.H. Assy. |
| 423.93' | | | | | | | |
| | 10 | | | | | | Top of Rock Socket |

085

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET: 2 OF 3 SHEETS | |
|---|-------|----------------------------------|---|--|-------------|-------------------------|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P11-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth Type | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 423.93' | 10 | | Dolomite - Grey - Mod Hard | | | | 4th 27RPM w/H2O 186.3' stem - kelly & D.H. Assy stop 12:22 grease swivel start 12:36 stop 3:17 EOD |
| | 11 | 45 min | 10.6 Dolomite - Gre. - Black Hard-Silic | | | | |
| | 12 | 49 min | 10.8 Dolomite - Grey - Mod Hard | | | | |
| | 13 | 46 min | 12.9-13.0 Shale - Black - Soft | | | | |
| | 14 | 33 min | 13.0 Dolomite - Buff - Grey Mod Hard | | | | |
| | 15 | 31 min | 13.5-13.6 Shale - Black - Soft | | | | |
| | 16 | 34 min | 13.6 Dolomite - Grey - Mod' Hard | | MILKY | SMOOTH | |
| | 17 | 40 min | 14.5 Dolomite - Buff - Grey Mod Hard (Buff slightly fractured with Iron Stains) | | | | |
| | 18 | 38 min | 14.9 Siltstone - Weathered - Soft - Brown | | | | |
| 417.93' | 19 | 41 min | 15.1 Dolomite - Buff - Mod Hard - Fractured | | | | |
| | 20 | | 17.3 Dolomite - Grey - Hard Siliceous | | | | 2/18/81 2/19/81 start 8:06 4th 27rpm w/H2O 186.30' stem - kelly & DH Assy |
| | | | 18.0 Dolomite - Grey - Hard Siliceous - Fractures with Iron Stains | | | | |
| 413.91' | | | 19.4 Dolomite - Buff - Mod Hard | | | | |

086

| | | | | | | | |
|--|-------|----------------------------------|---|---|-------------|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 62-P11-S-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 413.93 | 20 | | Dolomite - Buff - Mod Hard | | | | 4th 27rpm w/H20 186.3' stem - kelly & DH Assy stop 11:39 grease swivel start 11:53 stop 3:15 |
| | 21 | 34 min | 20.7 Dolomite - Buff - Mod Hard - S ightly Fractured with Iron Stains | | Milky | | |
| | 22 | 38 min | 21.4 Dolomite - Buff - Grey Mod Hard | | | | |
| | 23 | 31 min | 22.8 Shale - Black - Soft | | Grey | Smooth | |
| | 24 | 39 min | 22.85 Dolomite - Buff - Grey Mod Hard | | | | |
| | 25 | 35 min | 23.4 Dolomite - Grey - Mod Hard | | Milky | | |
| | 26 | 35 min | | | | | |
| | 27 | 30 min | 26.7 Dolomite - Buff - Mod Hard - Slightly Frac. | | | | |
| | 28 | 30 min | 27.6 Dolomite - Buff - Grey Mod Hard | | | | 1/18/81 1/19/81 start 4th 27rpm w/H20 186.3' stem - kelly & D.H. Assy Stop 7:43 boh |
| 404.8 | 29 | 13 min | | | | | Bottom of Rock Socket |

087

PROJECT

HOLE NO

| | | | |
|--|--|---|--|
| PROJECT NO. 03-79-C-0055 | | Masemen Construction Co. | |
| Norfolk Lake Bridges | | 102" Smith - Rock | |
| 62-P12-N-Socket | | Elevation of Bottom of Hole 429.8 | |
| Robert Schmoker | | Steven M. Hains | |
| HOLE NO. | | Casing Record Depth Type | |
| Don Uchtman | | 91.0 10 OD | |
| DIRECTION OF HOLE | | TOTAL NUMBER CORE BOXES | |
| <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED | | ELEVATION of Water 546.90 | |
| Boring Method: Reverse Rotary | | DATE HOLE STARTED COMPLETED | |
| DEPTH OF LEE INTO ROCK 35.6 | | 4/13/81 4/16/81 | |
| TOTAL DEPTH OF HOLE 36.78 | | ELEVATION TOP OF HOLE 558.1 TOP | |
| | | TOTAL CORE RECOVERY FOR BORING 466.58 TOG | |
| | | SIGNATURE OF INSPECTOR 465.4 TOR | |

| ELEVATION | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Color | Drill Action | REMARKS |
|-----------|------------|--|-------------|--------------|-------------------------------------|
| 466.58 | 19 min | SAND | | | 4/13/81 |
| | | CEMENT GROUT | | | Start 3:34 |
| 465.4 | 1 hr | Average Top of Rock | | | 1st w/H2O |
| 465.18 | 6 min | SAND Dolomite Light Grey Mod Hard | Muddy | Rough | 17rpm |
| | | | | | 156.22 Stem Kelly DH Assy |
| | 58 min | | | | Stop 4:18 @1.4 |
| | 3.2 | Dolomite - Buff - Mod Hard - Weathered | | | 4/14/81 |
| | 50 min | | | | Start 7:19 |
| | | | | | 1st 7rpm w/H2O |
| | 58 min | 4.8 Dolomite - Light Grey Mod Hard | | | 156.22 Stem Kelly & DH Assy |
| | 1 hr 8min | | | | Stop 8:27 |
| | | | | | Weld side plate |
| | 1 hr 34min | 6.0 Dolomite - Buff - Mod Hard | | | Start 9:38 |
| | | | | | Stop 10:15 |
| | | | | | Barge anchor |
| | | | | | let loose reseat anchor & align can |
| | | | | | Start 11:24 |
| | | | | | Stop 12:52 |
| | | | | | Plugged discharge |
| | | | | | Start 2:07 |
| | | | | | @4.0' 2nd 17rpm |
| | | | | | Stop 4:16 |
| 460.08 | 1 hr 32min | 6.6 Dolomite - Light Grey Buff - Mod Hard - Hard Silic | Milky Brown | Smooth | |
| | | | | | 4/14/81 |
| | | | | | 4/15/81 |
| | | | | | Start 7:29 2nd 17rpm w/H2O |
| | | | | | 156.22 Stem Kelly & DH Assy |
| | | | | | Stop 1:06 |
| | | | | | Straighten can |
| | | | | | Start 1:16 |
| | 1 hr 46min | 8.0 Dolomite - Buff - Grey Hard - Silic | Milky | | |
| | | | | | |
| | | | | | |
| | 1 hr 42min | 8.3 Dolomite - Buff - Grey Mod Hard | Brown | | |
| | | | | | |
| | | | | | |
| 456.58 | | | Milky Brown | | |

088

| | | | | | | | |
|---|--|----------------------------------|--|--|--|----------------------|--|
| DRILLING LOG | | PROJECT NO. DACW 03-79-C-0055 | | Mason Construction Co. | | 1 of 4 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 62-P12-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 14 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 15 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 16 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 17 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 STARTED COMPLETED | |
| 18 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 19 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (See Legend) | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|----------------|--------------|---|
| 456.58 | 10 | | Dolomite - Buff - Grey Mod Hard | | | 2nd 17rpm w/H2O 156.22' Stem Kelly & DH Assy |
| | 11 | 1 hr 8min | Dolomite - Buff - Mod Hard - Weathered | | | Stop 12.1 @ 4:18 |
| | 12 | 1 hr 19min | 11.6 Dolomite - Buff - Grey Mod Hard | | | 4/15/81 |
| 454.48 | 13 | 1 hr 13min | 12.6 Dolomite - Buff - Grey - Soft - Mod Hard - Weathered | | | 4/16/81 Start 7:34 2nd 17rpm w/H2O 156.22' Stem Kelly & DH Assy |
| | 14 | 1 hr 27min | 13.9 Dolomite - Buff - Grey Mod Hard | Milky Brown | Smooth | @14.3' - 10:10 4th 27rpm |
| | 15 | 42 min | 15.1 Dolomite - Buff - Mod Hard - Hard - Slightly Silic | | | |
| | 16 | 49 min | 16.8 Dolomite - Brown - Hard Siliceous | | | |
| | 17 | 46 min | 17.5 Dolomite - Grey - Mod Hard | Milky | | |
| | 18 | 46 min | 18.5 - 18.7 Clay seam - Brown - Soft | | | |
| | 19 | 42 min | 18.7 Dolomite - Brown - Mod Hard | Brown | Rough | |
| 446.58 | 20 | | | Milky Brown | Smooth | |

089

| DRILLING LOG | | PROJECT NO. | | CONTRACTOR | | SHEET | |
|---|--------|------------------|--|--|--------------|--|--|
| Norfolk Lake Bridges | | DAG 03-79-C-0055 | | Massman Construction Co. | | 104 | |
| LOCATION | | | | 10 SIZE AND TYPE OF BIT | | | |
| 62-P12-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 1 GEOTECHNICAL | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 14 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 15 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 16 DIRECTION OF HOLE | | | | 15 ELEVATION of Water | | | |
| <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 18 Boring Method: Rotary | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 19 TOTAL DEPTH OF HOLE | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Color | Drill Action | REMARKS | |
| 446.58 | 20 | | Dolomite - Brown - Mod Hard | | | 4th 27rpm w/H2O | |
| | 42 min | 20.3 | Dolomite - Brown - Mod Hard Fractured | Milky Brown | Smooth | 156.22 Stem Kelly | |
| | 21 | | 20.9 - 22.2 | | | @20.9 - 3:12 | |
| | 30 min | 21.8 | Cavern less than 1/3 of hole | Muddy | Rough | 1st 7rpm H2O off cavern 2nd 17 rpm w/H2O | |
| | 22 | | Dolomite - Milky White Hard - Highly Siliceous | | | @3:35 - 21/7 Stop 4:15 @23.1 | |
| | 25 min | | | | | | |
| 443.48 | 23 | | 23.4 | | | 4/16/81 | |
| | 32 min | | Dolomite - Milky White Mod Hard - Hard Weathered - Hard - Silic | Milky Brown | Smooth | 4/17/81 | |
| | 24 | | | | | Start 7:20 4th 27 rpm w/H2O | |
| | 31 min | 24.8 | Quartzite - Milky - Very Hard | | | 156.22 Stem Kelly & DH Assy | |
| | 25 | | | | | Stop 8:57 Grease Swivel | |
| | 38 min | 25.9 | Dolomite - 2/3 Tan - Hard - Silic - Vuggy with Calcite filled vugs - 1/3 Quartzite milky - Very Hard | | | Start 9:34 2nd 17rpm H2O on @26.9 | |
| | 26 | | | | | 27.1 1st 7rpm @28.0 2nd 17rpm | |
| | 34 min | 26.8 | Dolomite - Apprx 1/2 Tan Hard - Silic & Quartzite 1/2 Milky - Very Hard | Milky | Very Rough | | |
| | 27 | | | | | | |
| | 51 min | | | | | | |
| | 28 | | | | | | |
| | 30 min | | | | | | |
| | 29 | | | | | | |
| | 21 min | 29.8 | Quartzite - Milky - Very Hard - Dolomite Tan - Hard - Silic | | Mod Smooth | | |
| 436.58 | 30 | | | | | | |

090

DRILLING LOG

NO. 03-79-C-0055

MECHER Construction Co.

Lot 4

| | | | |
|---|--|---|--|
| PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT | |
| LOCATION 62-Pl2-N-Socket | | 11. Elevation of Bottom of Hole | |
| 1. GEOSTRATIGRAPHY | | 12. MANUFACTURER'S DESIGNATION OF DRILL | |
| 2. HOLE NO. | | 13. Casing Record Depth Type | |
| 3. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | |
| 4. DIRECTION OF HOLE VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> DEG FROM VERT | | 15. ELEVATION of Water | |
| 5. Boring Method: Rotary | | 16. DATE HOLE STARTED COMPLETED | |
| 6. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | |
| 7. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | |
| | | 19. SIGNATURE OF INSPECTOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|-------------|--------------|---------|
| 436.58 | 30 | | Appx. 90% Quartzite - Milky - Very Hard - Dolomite - Tan - Hard Silic. Appx. 10% | | | |
| | 31 | 30 min | 31.1 Dolomite - Brown - Hard Highly Siliceous | | | |
| | 32 | 55 min | 32.1 Dolomite - Tan - Hard - Silic - Fractures with Iron stains on Frac planes | Milky | Smooth | |
| | 33 | 32 min | 33.4 Dolomite - Grey - Mod Hard - Hard | | | |
| | 34 | 31 min | 34.9 Dolomite - Light Grey Mod Hard - Slightly frac w/FE stains on frac planes | | | |
| | 35 | 24 min | 35.2 Dolomite - Brown - Mod Hard - Hard - Slightly Silic | | | |
| | 36 | 14 min | 36.1 Dolomite - Buff - Grey Mod Hard | | | |
| 429.8 | | | 36.3 Dolomite - Grey - Mod Hard | | | |
| | | | Bottom of Rock Socket | | | |

Design Section of Rock Socket
#30.7

091

LOCATION: MAC 03-79-C-003 Massman Construction Co. 104
Watkins Lake Bridges Site and Type of Bit 102 Smith - Rock
62-Pl2-S-Socket Elevation of Bottom of Hole 429.80
Robert Schmoker Steven M. Hains
Casing Record Depth 10 Q.O.
Don Uchtman 14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water 547.33
16 DATE HOLE 4/21/81 COMPLETED 4/23/81
17 ELEVATION TOP OF HOLE 558.14 TOP
18 TOTAL CORE RECOVERY FOR BORING 463.97 TOG
19 SIGNATURE OF INSPECTOR 461.5 TOR
Boring Method: Reverse Rotary
20 DEPTH DRILLED INTO HOLE 31.7
21 TOTAL DEPTH OF HOLE 34.17

| DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS | Water Color | Drill Action | REMARKS |
|--------|------------|--|-------------|----------------|--|
| 463.97 | | SAND | | | Start 2:35 1st 7rpm w/H2O 156.22 Stem - Kelly & DH Ass |
| 1 | 7 min | | | | |
| 2 | 41 min | CEMENT GROUT | Muddy Brown | Slightly Rough | |
| 461.5 | | Average Top of Rock | | | |
| 3 | 19 min | 2.5 Siltstone - Tan - Yellow Soft | | | |
| 4 | 7 min | CLAY AND OVERBURDEN | | | |
| 5 | 13 min | 4.8 Quartzite - White - Vuggy Hard - Fractures | | | |
| 458.37 | | 5.4 Chert - Hard - Light Brown | | | 4/21/81 4/22/81 |
| 6 | 36 min | 5.8 Dolomite - Milky light Grey - Mod Hard - Hard Slightly Silic | Milky Brown | | Start 7:20 1st 7rpm w/H2O 156.22 Stem - Kelly & DH Ass |
| 7 | 46 min | 6.6 Dolomite - Light Brown Soft - Mod Hard - Friable | | | @ 7.0-8:27 4th 27rpm w/H2O |
| 8 | 19 min | | | Smooth | |
| 9 | 15 min | 8.2 Siltstone - Yellow - Soft - Mod Hard - Extremely Weathered | | | |
| 10 | 14 min | | Yellow | | |
| 453.97 | | | | | |

092

Location
 Norfolk Lake Bridges

62-P12-S-Socket

Description

Casing Record

Depth

Type

NAME OF DRILLER

TOTAL NUMBER CORE BOXES

ELEVATION OF WATER

DIRECTION OF HOLE

☐ VERTICAL
 ☐ INCLINED

DEG FROM VERT

DATE HOLE

STARTED

COMPLETED

ELEVATION TOP OF HOLE

TOTAL CORE RECOVERY FOR BORING

SIGNATURE OF INSPECTOR

Boring Method

Rotary

DEPTH DRILLED INTO ROCK

TOTAL DEPTH OF HOLE

| DEPTH (ft) | TIME (min) | CLASSIFICATION OF MATERIALS (Description) | Water Color | Drill Action | REMARKS |
|------------|------------|---|-------------|----------------------|---------------------------|
| 453.97 | 10 | | | | Stop @10.0 |
| | 14 min | Siltstone - Yellow - Soft | | | @9:15 Tighten Kelly Bolts |
| | | Mod Hard - Extremely Weathered | Yellow | | Start 9:36 |
| 11 | | 10.8 | | | 4th 27rpm |
| | | Dolomite - Buff - Light | | | w/H20 156.22 |
| | 16 min | Grey - Mod Hard - Fracture with Fe Stains | | | stem - kelly & DH Assy |
| 12 | | | | | |
| | 17 min | | | | |
| 13 | | | | | |
| | 18 min | | | Milky Smooth Brown | |
| 14 | | | | | |
| | 17 min | | | | |
| 15 | | | | | |
| | 17 min | | | | |
| 16 | | | | | |
| | 16 min | 16.7 Dolomite - Grey - Mod Hard | | | |
| 17 | | 17.2-18.5 Dolomite - Grey - Mod Hard w/clay filled vugs | | | |
| | 23 min | | | | |
| 18 | | | | Brown Slightly Rough | |
| | 10 min | 18.5 Dolomite - Grey - Mod Hard | | | |
| 19 | | | | | |
| | 16 min | | | Milky Smooth | |
| 443.97 | 20 | | | | |

| | | | |
|--|--|------------------------------------|--|
| Project No. 100 | | Project Name | |
| DACW 03-78-C-0025 | | Moseman Construction Co. | |
| Norfolk Lake Bridges | | 10. SIZE AND TYPE BIT | |
| 62-P12-S-Socket | | 11. Elevation of Bottom of Hole | |
| 12. MANUFACTURER'S DESIGNATION OF BIT | | 13. Casing Record (Depth) (Type) | |
| 14. NAME OF DRILLER | | 15. TOTAL NUMBER CORE BOXES | |
| 16. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 17. ELEVATION OF WATER | |
| 18. Boring Method: Rotary | | 19. DATE HOLE STARTED COMPLETED | |
| 20. DEPTH DRILLED INTO ROCK | | 21. ELEVATION TOP OF HOLE | |
| 22. TOTAL DEPTH OF HOLE | | 23. TOTAL CORE RECOVERY FOR BORING | |
| | | 24. SIGNATURE OF INSPECTOR | |

| ELEVATION | Depth | Drill Rate | CLASSIFICATION OF MATERIAL (Description) | Water | Drill Color | Action | REMARKS |
|-----------|-----------|------------|--|-------|-------------|--------|-------------------------------|
| 413.97 | 20 | | | | | | |
| | 16 min | | Dolomite - Grey - Mod Hard | | | | 4th 27rpm w/H2O |
| | 20.5 | | Quartzite appx. 50% Milky White - Hard and Dolomite - 50% Hard Grey - Silic | | | | 156.22 Stem - Kelly & DH Ass. |
| 21 | | | | | | | @22.0 1st 7rpm |
| | 18 min | | | | | | 2nd 17rpm @23.6 |
| 22 | | | 22.0 (appx 2/3) Dolomite - Grey - Mod Hard and (appx 1/3) Quartzite Milky - White - Hard | | | | 25.1 1st 7rpm |
| | 26 min | | | | | | H2O off |
| | | | | | | | @3:02 @26.0 |
| | | | | | | | 2nd 17rpm w/H2O |
| | | | | | | | @26.4 4th 27rpm |
| | | | | | | | w/H2O Stop 4:15 |
| | | | | | | | @30/0 |
| 23 | | | 23.1 - 23.6 Cavern (Est less than 1/8 of hole) | | | | |
| | 24 min | | | | | | |
| 24 | | | 24.1 (appx. 2/3) Quartzite - Milky White Hard - Vuggy and Dolomite - Grey - Mod Hard (appx. 1/3) | | | | |
| | 10 min | | | | | | |
| 25 | | | | | | | |
| | 1 hr 8min | | | | | | |
| 26 | | | 25.9 Dolomite - Brown - Highly Siliceous - with brown chert nodules - Hard | | | | |
| | 16 min | | | | | | |
| 27 | | | | | | | |
| | 22 min | | 27.1 Dolomite - Light Grey Mod Hard | | | | |
| 28 | | | 27.5 Dolomite - Grey - Mod Hard fractures with Iron stains | | | | |
| | 16 min | | | | | | |
| 29 | | | | | | | |
| | 19 min | | | | | | |
| 433.97 | 30 | | | | | | |

094

| | | | |
|--|----------------------------------|--|------------------------|
| DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith - Rock | |
| 62-P13-N-Socket | | 11 Elevation of Bottom of Hole 513.9' | |
| Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven Hains | |
| HOLE NO | | 13 Casing Record | Depth 7.5 Type 10'OD |
| NAME OF DRILLER Don Uethman | | 14 TOTAL NUMBER CORE BOXES | |
| DIRECTION OF HOLE * Air Assist Rotary | | 15 ELEVATION of Water 543.85 | |
| Boring Method: Rotary | | 16 DATE HOLE STARTED 2/26/81 COMPLETED 3/10/81 | |
| DEPTH DRILLED INTO ROCK 26.0' | | 17 ELEVATION TOP OF HOLE 547.9 TOC | |
| TOTAL DEPTH OF HOLE 29.5' | | 18 TOTAL CORE RECOVERY FOR BORING 543.4 TOG | |
| | | 19 SIGNATURE OF INSPECTOR Drill 539.9 TOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 543.4 | | | | | | | |
| | 1 | 28 min | CEMENT | | | | Start 2:15 1st 7rpm w/H2O 57.5 Kelly & DH Assy Straight Rotary Air Assist @2' 2nd 17rpm Stop 3:10 |
| 541.5' | | 16 min | Top of Rock before Chisel Excavation | | Cement Gray | Smooth | |
| | 2 | | GROUT | | | | |
| 540.9' | | 18 min | | | | | 2/26/81 |
| | 3 | | | | | | 2/27/81 |
| 539.9' | | 55 min | Top of Rock | | | | Start 8:55 2nd 17rpm w/H2O 57.5 Kelly & DH Assy Straight Rotary Air Assist Stop 9:04 Bit Alignment |
| | 4 | | Dolomite - Buff - Mod Hard | | | Rough | Start 10:29 1st 7rpm WT Held Stop 11:56 Gasket Blowout Stabilizer Pads Put on |
| 538.4' | | 57 min | 4.8 Dolomite - Buff - Grey Mod Hard | | Milky | Smooth | Start 1:43 1st 7rpm 2nd 17rpm @4.0 1st 7rpm @4.5 Stop 3:06 @5.0 2/27/81 |
| | 5 | | | | | | |
| | 6 | 55 min | 5.8 Dolomite - Grey - Mod Hard | | | | |
| | | 1hr 5min | | | | | 2/28/81 |
| | 7 | | | | | | Start 8:06 1st 7rpm w/H2O 57.5 Kelly & DH Assy Straight Rotary Air Assist 2nd 17rpm @8:16 Stop 9:52 ADD 8.0' can to top of bit body |
| | 8 | 1hr 3min | 7.5 Dolomite - Hard - Silic Grey - Brown | | | | Start 11:26 2nd 17rpm 4th 27rpm @11:45 2nd 17rpm @12:11 7.5 |
| | | 56 min | 7.8 Dolomite - Mod Hard - Grey | | | | |
| | 9 | | | | | | |
| | | 1hr 1min | 9.7 Dolomite - Grey - Hard Silic | | | | |
| 533.4' | 10 | | | | | | |

096

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
|--|-----------|---|--|---|-------------|--|---|
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 62-Pl3-N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 1 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth Type | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE MOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF MOLE | | | |
| 9 TOTAL DEPTH OF MOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 533.4' | 10 | | con't | | | | |
| 532.9' | 50 min | Dolomite - Grey - Hard Silic | | | | | 2nd 17rpm 57.5 Kelly & DH Assy Straight Rotary |
| | | 10.2' | | | | | Air Assist w/H2O Stop 3:15 3/2/81 |
| | 56 min | Dolomite - Grey - Mod Hard | | | | | Start 9:46 2nd 17rpm 57.5 Kelly & DH Assy Straight Rotary |
| | | 11.4 - 11.5 Chert - Brown - Hard | | | | | Air Assist w/H2O Stop 1:52 Broke weld on 8' can on bit body |
| | 41 min | 11.5 Dolomite - Buff - Grey Mod Hard | | | | | |
| | | 12.5 Dolomite - Light Grey Mod Hard - Dark Grey | | | | | |
| | 41 min | 13.0 - 13.05 Hard - Silic - Dolomite | Milky | Smooth | | | |
| | | 13.05 Chert Seam - Brown - Hard | | | | | |
| | 56 min | Dolomite - Light Grey Mod Hard | | | | | |
| | | 13.9 Dolomite - Grey - Hard Silic | | | | | |
| | 14.4 | Dolomite - Brown - Grey Hard | | | | | |
| 14.8 Dolomite - Grey - Mod Hard | | | | | | | |
| 527.9' | 1hr 6min | 15.8 Dolomite - Grey - Mod Hard | | | | 3/2/81 3/3/81 | |
| 524.9' | 1hr 14min | 16.7 Dolomite - Grey - Mod Hard | | | | Start 7:41 2nd 17rpm 57.5 Kelly & DH Assy Straight Rotary Air Assist w/H2O Stop 10:45 18.5 | |
| | | 17.9-18.0 Shale - Black - Soft | Milky | Smooth | | | |
| | 57 min | 18.0 Dolomite - Brown - Grey Mod Hard - Hard Slightly Silic | | | | | 097 |
| | | 19.8 Dolomite - Grey - Mod Hard | Milky | Smooth | | | 3/9/81 Start 1:04 18.5 2nd 17rpm Straight Rotary w/H2O Air Assist 67.5 Stem Kelly & DH Assy Stop 2:10 Air Cops Repa |

| | | | | | | | |
|--|--------|----------------------------------|--|---|-------------|-----------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Maseman Construction Co. | | SHEET 3 of 3 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 62-P13 N-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 1 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth | Type |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | 16 DATE HOLE | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | |
| 8 DEPTH DRILLED INTO ROCK | | | | 19 SIGNATURE OF INSPECTOR | | | |
| 9 TOTAL DEPTH OF HOLE | | | | Drill | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Water Action | REMARKS |
| 523.4' | 20 | | con't | | | | |
| | 47 min | | Dolomite - Grey - Mod Hard | | | | 3/9/81 |
| | 21 | | 20.2 Dolomite - Sandy - Quart Sand - Well Rounded - Dolomite - Grey - Mod Hard | Milky | | Smooth | 2nd 17rpm 67.5 Kelly Stem & DH ASSY Straight Rotary Air Assist |
| | 43 min | | 21.3 Sandstone - Quartz - Well Rounded - Ca Cemented | | | | |
| 521.5' | 22 | | 21.6 Dolomite - Grey - Mod Hard - Weathered | | | | 3/9/81 |
| | 59 min | | 22.5 Dolomite - Grey - Brown - Mod Hard | | | | 3/10/81 |
| | 23 | | 23.6 Dolomite - Grey - Dark Grey - Soft - Mod Hard Weathered | Milky | | | Start 7:21 21.5 2nd 17rpm 67.5 Kelly Stem & DH Assy. Straight Rotary Air Assist Stop 12:45 BOH |
| | 34 min | | 24.4 Dolomite - Dark Grey - Mod Hard | | | | |
| | 24 | | 25.45-25.5 Weathered Dolomite Pod White - Soft | | | | |
| | 37 min | | 25.5 Dolomite - Dark Grey Mod Hard | Grey | | Smooth | |
| | 25 | | 26.6 Dolomite - Grey - Mod Hard | | | | |
| | 46 min | | 27.2 Dolomite - Grey - Mod Hard | | | | |
| | 27 | | 28.2 Dolomite - Grey - Mod Hard | | | | |
| | 47 min | | | Milky | | | |
| | 28 | | | | | | |
| | 46 min | | | | | | Design Bottom of Rock Socket 514.7 |
| | 29 | | | | | | |
| 513.9' | 9 min | | Bottom of Rock Socket | | | | |

098

| DRILLING LOG | | Project No. DASH 01-79-0-2055 | | CONTRACTOR WASSTEC CONSTRUCTION CO. | | Hole No. SHEET 1 OF 3 SHEETS | |
|---|-------|----------------------------------|--|---|-------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith - Rock | | | |
| 2 LOCATION 62-Pl3-S-Socket | | | | 11 Elevation of Bottom of Hole 514.0' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven Hains | | | |
| 4 HOLE NO | | | | 13 Casing Record Depth Type 10.0 OD | | | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 Elevation of Water 542.95 | | | |
| 7 Boring Method Air-Assist | | | | 16 DATE HOLE STARTED 2/7/81 COMPLETED 3/9/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 24.8' | | | | 17 ELEVATION TOP OF HOLE 546.9' TOC | | | |
| 9 TOTAL DEPTH OF HOLE 28.08' | | | | 18 TOTAL CORE RECOVERY FOR BORING 542.08' TOG : 538.8' TOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | | | Drill Action | |
| 542.08' | | 3min | CEMENT | | | 2/7/81 Start 10:46 57.5 Kelly & DH Assy 1st 7rpm Air Rotary Stop 11:02 Kelly Check | |
| | 1 | 3min | GROUT | | Grey | Start 11:06 Stop 11:30 H2O Leak Start 2:17 Stop 2:30 @3.3 10' casing blow out | |
| | 2 | 3min | | | | | |
| | 3 | 32min | | | | | |
| 538.8' | | 10min | | | | | |
| | 4 | | HAND EXCAVATED ROCK | | | | |
| | 5 | 9min | Dolomite - Brown - Grey Mod Hard - Hard - 1 hour Slightly Silic 2min @ 5.4' | | | 3/3/81 Start 1:14 1st 7rpm 57.5 Kelly & DH Assy Straight Rotary - Air Assist with H2O 2nd 17rpm @5.0' Stop 3:15 @7.1' | |
| | 6 | | Dolomite - Brown - Hard - SILIC | | Milky | | |
| | 7 | 43 min | 6.4 Dolomite - Brown - Mod Hard | | | | |
| 534.98' | | 50min | | | | 3/4/81 Start 7:23 2nd 17rpm 57.5 Kelly & DH Assy. Straight Rotary Air Assist. w/H2O Stop 8:45 Tighten Kelly bolts Start 9:02 Top of Rock Socket | |
| | 8 | | | | | | |
| 534.7 | | 1 hour 36min | 8.4 Dolomite - Grey - Hard Silic | | | | |
| | 9 | | 9.2 Dolomite - Grey - Brown Mod Hard | | | | |
| | | 1 hour 8min | 9.8 Dolomite - Buff - Grey Mod Hard | | | | |
| 532.08 | 10 | | | | | | |

| | | | | |
|---|--|--|---|------------------------|
| DRILLING LOG | | Project No. NORF 03-79-0-0013 | Contractor M. J. R. Construction Co. | SHEET 2 OF 3 SHEETS |
| 1. PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT 102" Smith - Rock | | |
| 2. LOCATION 62-P13-S-SUCCESS | | 11. Elevation of Bottom of Hole | | |
| 3. Geotechnician | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4. HOLE NO. | | 13. Casing Record Depth Type | | |
| 5. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15. Elevation of Water | | |
| 7. Boring Method Rotary | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | |
| 8. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | | |
| 9. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING | | |
| | | 19. _____ | | |

| ELEVATION | DEPTH | Drill | CLASSIFICATION OF MATERIALS (Description) | Water | Drill |
|-----------|-------|----------------|--|--------|---|
| | 10% | Rate | con't | Color | Action |
| | | | Dolomite - Buff - Grey Mod Hard | | con't |
| | | 1hour 9 min | 10.3 10.35 Chert Brown - Hard | | 2nd 17rpm 57.5' |
| | 11 | | 10.35 Dolomite - Grey - Mod Hard | | Kelly & DH Assy Straight Rotary Air Assist w/H2O |
| | | 43 min | 11.4 Dolomite - Grey - Brown Mod Hard | | Stop 12:59 Weld can on Bit Body |
| 530.08 | 12 | | 12.3 Dolomite - Grey - Mod Hard | Smooth | 3/4/81 |
| | | 50 min | | | 3/5/81 |
| | 13 | | | | Start 7:28 2nd 17rpm |
| | | 1hour 5min | 13.9 Dolomite - Mod Hard - Hard - Grey - Brown | Milky | 57.5 Kelly & DH Assy Straight Rotary Air Assist w/H2O |
| | 14 | | 14.3 Dolomite - Grey - Soft Mod Hard | | 14.3 1st 7rpm 15.0 2nd 17rpm Stop 12:40 |
| | | 1hour 6min | | Rough | |
| | 15 | | 15.1 Dolomite - Grey - Mod Hard | | |
| | | 1hr 17min | | | |
| | 16 | | | Smooth | |
| | | 54min | | | |
| 525.08 | 17 | | | | 3/5/81 |
| | | 1hour 50min | 17.6 Dolomite - Buff - Grey Mod Hard | | 3/7/81 |
| | 18 | | Reverse Rotary | | Start 7:48 Reverse Rotary 67.5 Stem Kelly & DH Assy |
| | | 1hour 22min | 18.6 Dolomite - Grey - Mod Hard | Milky | 2nd 17rpm w/H2O 17.5' 8:30 4th 27rpm Stop 10:28 |
| | 19 | | | Smooth | Switch to Straight Rotary Air Assist. |
| | | 47min | 19.6 Dolomite - Sandy (Quartz Sand well rounded) Grey Mod Hard | | Start 10:55 4th 27rpm Stop 11:12 Cat discharge holes in can Start 11:22 2nd 17rpm |
| 20 | | | | 100 | |

| DRILLING LOG | | Project No. | Contractor | Hole No. | SHEET 3 |
|---|--------|-------------------|---|-------------|--|
| | | DACW 03-79-C-0055 | WAGSTAR Construction Co. | OF 3 SHEETS | |
| 1. TITLE Norfolk Lake Bridges | | | 10. SIZE AND TYPE OF BIT | | |
| 2. LOCATION 62-P13-S-Socket | | | 11. Elevation of Bottom of Hole | | |
| 3. Geotechnician | | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4. HOLE NO. | | | 13. Casing Record Depth Type | | |
| 5. NAME OF DRILLER | | | 14. TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | 15. Elevation of Water | | |
| 7. Boring Method Rotary | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | |
| 8. DEPTH DRILLED INTO ROCK | | | 17. ELEVATION TOP OF HOLE | | |
| 9. TOTAL DEPTH OF HOLE | | | 18. TOTAL CORE RECOVERY FOR BORING | | |
| | | | 19. | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Color | Drill Action |
| 522.08 | 20 | | con't | | con't |
| | 36 min | | Dolomite - Sandy (Quartz Sand well rounded) Dolomite - Grey - Mod Hard | | 67.5' Kelly Stem DH Assy. 2nd 17rpm Straight Rotary Air Assist Stop 2:33 Mark Kelly |
| | 21 | | 21.2 Dolomite - Grey - Dark Grey - Mod Hard | | Start 2:37 Stop 3:09 Engine Check Start 3:47 Stop 4:13 24.8 |
| | 43 min | | | | |
| | 22 | | 22.4 Dolomite - Grey - Mod Hard & Light - Grey Hard Silic 22.8-22.85 Shale - Black - Soft 22.85 Dolomite - Grey - Dark Grey - Mod Hard 23.7 Dolomite - Dark Grey Mod Hard | Milky | Smooth |
| | 40 min | | | | |
| | 23 | | | | |
| | 32 min | | | | |
| | 24 | | | | |
| 517.38 | 49 min | | | | 3/7/81 |
| | 25 | | 25.7 Dolomite - Light Grey Mod Hard - Weathered | | 3/9/81 Start 7:32 @24.7 67.5' Kelly Stem & BH Assy. 2nd rpm (17) Straight Rotary Air Assist w/H2O Stop 10:12 BOS |
| | 58 min | | | | |
| | 26 | | | | |
| | 51 min | | 26.8 Dolomite - Grey - Mod Hard 27.1 Dolomite - Brown - Grey Mod Hard - Hard | | Design Bottom of Rock Socket 514.7 |
| | 41 min | | | | |
| 514.0 | 28 | | Bottom of Rock Socket | | |

| | | | | | | | |
|---|--|----------------------------------|--|--|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 4 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith - Rock | | | |
| 2 LOCATION H101-P1-West-Socket | | | | 11 Elevation of Bottom of Hole 497.4' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M Hains | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth 31' | | Type 10 O.D. | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 548.62 | | | |
| | | | | 16 DATE HOLE 7/21/81 | | COMPLETED 7/25/81 | |
| 7 Boring Method: Straight Rotary Air Assist | | | | 17 ELEVATION TOP OF HOLE 559.88' TOP | | | |
| 8 DEPTH DRILLED INTO ROCK 32.48' | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE 34.48' | | | | 19 SIGNATURE OF INSPECTOR 529.88' TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|--|
| 531.88' | | | | | | | |
| | 1 | 4 min | SAND | | Brown | | 7/21/81 Lake El 548.62 Start 3:03 1st 7rpm Straight Rotary - Air Assist 77.5' |
| | | 4 min | | | | | Smooth Stem - Kelly DH Assy |
| 529.88 | 2 | | Top of Rock | | | | Stop 4:31 Remove Bit Blocks Start 5:05 |
| | | 37 min | 2.0 Dolomite - Light Grey - Mod Hard - & Hard - Slightly Silic | | Milky | | 2nd 17rpm Stop 5:25 4.5' |
| | 3 | | | | | | |
| | | 43 min | 3.5 Dolomite - Light Grey Mod Hard | | | | |
| 527.38 | 4 | | | | | | |
| | | 40 min | | | | | 7/21/81 7/22/81 Start 7:13 2nd 17rpm 77.5' |
| | 5 | | | | | | stem-kelly- DH Assy |
| | | 37 min | 5.4 Dolomite - Sandy (well Rounded Sand) Mod Hard Light Grey | | | | |
| | 6 | | | | | | |
| | | 25 min | | | | | |
| | 7 | | | | | | |
| | | 26 min | | | | | |
| | 8 | | | | | | |
| | | 25 min | 8.5 Dolomite - Mod Hard Light Grey | | | | |
| | 9 | | | | | | |
| | | 35 min | | | | | |
| 521.88 | 10 | | | | | | |

102

| | | | | | | | |
|---|--|---|--|--|--|----------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 of 4 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-Pl-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR DRILLING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|--|------------|-------------|--------------|---|
| 521.88 | 10 | | | | | | |
| | 35 min | | Dolomite - Mod Hard - Light Grey | | Milky | | 2nd gear 15rpm Straight Rotary Air Assist 77.5 Kelly - stem - DHA |
| | 11 | | | | | | @13.5 |
| | 36 min | | 11.3 Clay - Red - Soft | | Red | | Stop 1:00 |
| | 12 | | 11.5 Dolomite - Buff - Mod Hard - Weathered | | Milky Brown | | Switch to Reverse Rotary |
| | 54 min | | 12.1 Dolomite - Buff - Grey Mod Hard - Hard - Grey Slightly Silic | | | Smooth | Start 1:50 4th 27rpm 14.3 4:00 |
| | 13 | | | | | | Switch back to Rotary & 2nd 17rpm |
| | 1 hr | | 13.1 - 13.3 Clay - Red - Soft | | Red | | |
| | 55 min | | 13.3 Dolomite - Buff - Grey Mod Hard - Hard - Grey Slightly Silic | | Milky Brown | | |
| Reverse | 14 | | | | | | |
| 2hr 10min | 1 hr | | | | | | |
| | 5 min | | | | | | |
| | 15 | | | | | | |
| 516.38 | 1 hr | | 15.6 Dolomite - Grey - Hard Siliceous - Massive | | | | 7/22/81 |
| | 19 min | | 16.4 Dolomite - Buff - Grey Mod Hard | | | | 7/23/81 |
| | 16 | | 16.8 - 17.0 Clay Seam (est 1/2 of hole) | | | | Lake El 548.42 |
| | 3 hr | | 17.0 Sandy Dolomite - Buff Grey - Silic - Hard | | | | Start 7:45 |
| Reverse | 7 min | | 17.5 Dolomite - Grey - Buff Mod Hard - Hard - Grey Silic | | | | 2nd rpm 17 |
| Rotary | 17 | | | | | | 77.5' stem - Kelly & DH Ass |
| | 1 hr | | | | | | 16' Switch to Reverse Rotary |
| | 59 min | | | | | | 4th 27rpm w/H2O |
| | 18 | | | | | | Stop 2:20 18.1 |
| 45 min | 1 hr | | | | | | Switch to Straight Rotary Air |
| | 40 min | | | | | | Assist Repair Pennant Line |
| | 19 | | | | | | Bushing |
| | 40 min | | | | | | Start 3:50 19. |
| | 20 | | | | | | Stop 5:25 20.0 |
| 511.88 | 20 | | | | | | |

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| | | | | |
|--|--|--|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 4 SHEETS |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION 101-PI-West-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| HOLE NO | | 13 Casing Record Depth Type | | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water | | |
| Boring Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | | |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------------|------------|---|------------|----------------|---------------|--|
| 511.88 | 20 | | | | | | |
| | 55 min | | Dolomite - Grey - Buff Mod Hard - Hard - Grey Silic 20.5 | | | | 7/24/81 Lake el 548.30 Start 7:28 @ 20.0 2nd 17rpm |
| | 21 | | Sandy Dolomite - Buff - Mod Hard - Si grains Well rounded | | Milky Brown | Smooth | Straight Rotary Air Assist Stop 9:04 Add 20' Joint |
| | 41 min | | 21.1 Dolomite - Buff - Grey Mod Hard | | | | Start 10:30 97.5 stem - Kelly & DHA 28.0-1:34 H2O off and Air Off (smooth hole) |
| | 22 | | | | | | 1st 7rpm Stop 2:00 Gear box Adj Start 3:25 Stop 5:30 29.3' |
| | 39 min | | 22.7 Dolomite - Grey - Mod Hard | | | | |
| | 23 | | | | | | |
| | 31 min | | | | | | |
| | 24 | | | | | | |
| | 34 min | | | | | | |
| | 25 | | | | | | |
| | 30 min | | | | | | |
| | 26 | | 26.0 Dolomite - Buff - Grey Mod Hard - Slightly Frac. | | | | |
| | 23 min | | | | | | |
| | 27 | | 27.9 (est 1/8 of hole) Quartzite Milky - White Hard & Dolomite - Buff Grey - Mod Hard -(3/4 of hole) & Cavity - Clay filled (est 1/8 of hole) | | | | |
| | 27 min | | | | | | |
| | 28 | | | | | | |
| | 2 hr 21min | | | | Red | New Rough | |
| | 29 | | 29.0 Cavity Ends 50% Quartzite 50% Dolomite | | | | |
| 502.58 | 33 min | | 29.6 Quartzite - Milky White Hard with clay filled vugs | | Milky Brown | Mod Smooth | 7/24 7/25 Start 7:13 29.3 2nd 17rpm Straight Rotary Air Assist 97.5 stem Kelly |
| 501.88 | 30 | | | | | | |

| PROJECT | | Project No. | | Contractor: | | SHEET | |
|-------------------------|-------|---------------------|---|--|-------------|--------------------------------|--|
| Norfolk Lake Bridges | | DACW 03-79-C-0055 | | Massman Construction Co. | | OF 4 SHEETS | |
| LOCATION | | H101-Pl-West-Socket | | 10 SIZE AND TYPE OF BIT | | 11 Elevation of Bottom of Hole | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO | | 1 | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water | |
| DIRECTION OF HOLE | | DEC FROM VERT | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| Boring Method: | | Rotary | | 18 TOTAL CORE RECOVERED FOR TESTING | | 19 SIGNATURE OF INSPECTOR | |
| DEPTH DRILLED INTO ROCK | | | | | | | |
| TOTAL DEPTH OF HOLE | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 501.88 | 30 | | Quartzite - Milky White Hard with Clay filled Vugs | | | | 2nd 17rpm Straight Rotary Air Assist 97.5 Stem - Kelly DHA |
| | 31 | 55 min | | | Milky | Mod Smooth | Stop 9:35 Gear Box Adj |
| | 32 | 41 min | | | | | Start 9:46 Stop 10:01 Gear Box Adj |
| | 33 | 38 min | | | | | Start 10:25 Stop 11:23 B.O.H. |
| 497.9 | 34 | 40 min | 33.4 Dolomite - Buff - Mod Hard 50% of hole & Quartzite - Milky | | | | Plan BOH |
| 497.4 | | 18 min | White - Hard 50% of hole Bottom of Rock Socket | | | | |

| | | | | | | | |
|--|--|---|--|--|--|---|-----------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 6 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION 101-Pl-East-Socket | | | | 11 Elevation of Bottom of Hole 489.8' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth 25' | Type 10' OD |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 7/29 Elev. 548.1 | | | |
| 7 Boring Method: Straight Rotary Air Assist | | | | 16 DATE HOLE 7/29/81 | | 17 ELEVATION TOP OF HOLE 556.53' 8/7/81 revise | |
| 8 DEPTH DRILLED INTO ROCK 42.23 | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE 42.23 | | | | 19 SIGNATURE OF INSPECTOR 532.03' TC Rock | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|-------------------|
| 532.03' | | | Top of Rock | | | | |
| | | 35 min | Dolomite - Buff - Mod Hard | | | | Start 7:50 |
| | 1 | | | | | | 1st 7rpm Straight |
| | | 36 min | | | | | Rotary - Air |
| | 2 | | | | | | Assist 77.5' |
| | | 34 min | | | | | stem - kelly s |
| | 3 | | | | | | DHA |
| | | 30 min | 3.4 Dolomite - Buff - Mod Hard - Slightly Frac. | | | | 81.5' - 8:42 |
| | 4 | | | | | | 2nd 17rpm |
| | | 35 min | | | | | |
| | 5 | | | | | | |
| | | 32 min | | | | | |
| | 6 | | | | | | |
| | | 28 min | 6.5 Sandy Dolomite - Buff Mod Hard - (Very fine Silica sand) | | | | |
| | 7 | | | | | | |
| | | 27 min | | | | | |
| | 8 | | | | | | |
| | | 29 min | 8.4 Dolomite - Buff - Mod Hard | | | | |
| | 9 | | | | | | |
| | | 44 min | | | | | |
| 522.03' | 10 | | | | | | |

106

| | | | | | | | |
|--|--------|----------------------------------|--|---|-------------|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 6 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 101-Pl-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 522.03' | 10 | | | | | | |
| | 22 min | | Dolomite - Buff - Mod Hard | | | | 2nd 17rpm Straight Rotary Air Assist 77.5 stem - kelly & DHA |
| | 11 | | | | | | Stop 2:48 @14.0 gear box adj. |
| | 25 min | | | | | | Start 3:50 @14.0 |
| | 12 | | | | | | 4th 27rpm |
| | 23 min | | | | | | Stop 7/29 5:20 @18.0 |
| | 13 | | | | | | |
| | 18 min | | 13.2 Dolomite - Buff - Mod Hard - Slightly Frac | | | | |
| | 14 | | | | | | |
| | 16 min | | | | | | |
| | 15 | | | | | | |
| | 21 min | | | | | | |
| | 16 | | | | | | |
| | 25 min | | 16.5 Dolomite - Grey - Mod Hard | | | | |
| | 17 | | | | | | |
| | 28 min | | | | | | |
| 514.03' | 18 | | | | | | 7/29 |
| | 25 min | | 18.4 Dolomite - Buff - Grey Mod Hard | | | | 7/30 |
| | 19 | | | | | | Start 7:04 2nd 17rpm - 77.5' |
| | 25 min | | | | | | stem - kelly - DHA |
| | | | | | | | Stop 7:16 Fuel Leak Start 7:37 |
| | | | | | | | 4th 27rpm |
| | | | | | | | Lake el 548.04 |
| 512.03' | 20 | | | | | | |

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| DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Hassman Construction Co. | Sheet 3 of 6 |
| Norfolk Lake Bridges | | 10 Size and Type of Bit | |
| 101-P1-East-Socket | | 11 Elevation of Bottom of Hole | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | |
| HOLE NO. | | 13 Casing Record Depth Type | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water | |
| Drilling Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | |
| | | 19 SIGNATURE OF INSPECTOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|------------|------------|--|-------------|-------------|--------------|--|
| 512.03 | 20 | | | | | | 7/30/81 |
| | 20 min | | Dolomite - Buff - Grey Mod Hard | | | | 4th 27rpm 77.5 |
| | 21 | | Dolomite - Buff - Mod Hard - slightly Frac | | Milky Brown | Smooth | stem - Kelly & DHA @21.5 1st 7rpm |
| | 16 min | | 21.5 Cavity clay filled (est < 1/8 of hole) | | | | Stop 8:51 @22.0 |
| | 22 | | Red in above Dolomite - | | Red | Rough | Add 20' stem Start 11:38 1st 4rpm |
| 509.83 | 1 hr 1 min | | | | | | Stop 1:25 Gear Box Adj Start 1:53 |
| | 23 | | 23.8 Cavity (Est 30% of hole) | | | | Stop 2:02 Gear Box Adj Start 2:05 |
| | 31 min | | | | | | Stop 2:12 Mark Kelly Start 2:18 |
| | 24 | | 24.8-28.9 Cavity - Red Clay filled 100% of hole | | | | Stop 2:30 Flush and Ream Hole Start 3:08 |
| | 17 min | | | | | | Stop 3:32 Flush Hole 7/31/81 |
| | 25 | | | | | | Clay cavern grout to Elev 509.83 22.2' |
| | 5 min | | | | | | 8/3/81 Cement Grout Drilled out |
| | 26 | | | | | Mod Smooth | |
| | 3 min | | | | | | |
| | 27 | | | | | | |
| | 3 min | | | | | | |
| | 28 | | 28.9 Cavity (Est < 1/8 of hole) Balance = Sandy Dolomite Light Grey - Soft - Mod Hard and Buff - Mod Hard Dolomite - | | | | 8/3/81 Lake Elev 547.5 Start 4:40 @29.5 |
| | 11 min | | | | | | 97.5 Stem - Kelly & DHA 1st 7rpm |
| | 29 | | 29.4 Quartzite - Milky White Hard Vuggy | | Mod Rough | | Straight Rotary Air Assist |
| 502.53 | 58 min | | | | | | 329.8 2nd 17rpm |
| 502.03 | 20 | | | Milky White | | | 7/30/81 Stop 4:18 8/3/81 30.0' |

| | | | | | | | |
|--|--|---|--|---|--|---|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Missman Construction Co. | | Sheet 4 of 6 SHEETS | |
| PROJ Norfolk Lake Bridges | | | | 11 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 LOCATION 101-P1-East-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Surface Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|--|
| 502.03' | 30 | 1hr 9min | Quartzite - Milky White Hard - Vuggy | | Milky White | Mod Smooth | Start 7:38 30.0 Lake Elev 548.87 |
| | 31 | | 31.1 Clay filled Cavern in above Quartzite (Est 1/4 of hole) | | Red | Rough | 97.5 stem - Kelly & DH Assy 2nd 17rpm |
| | 32 | 18 min | 31.5 - 33.1 Clay filled Cavern 100% of hole | | | Smooth | Stop 8:32 Gear Box Adj Start 8:37 Stop 8:55 Gear Box Adj Start 9:03 |
| | | 11 min | | | | | 31.1 1st 5rpm Weight held back 31.1 - 34.1 |
| | 33 | | 33.1 Dolomite - Grey - Weathered - Soft | | | | Stop 10:25 34.1 Start 10:27 |
| | | 32 min | 33.8 Dolomite - Buff - Mod Hard & Siltstone Pod | | Brown | Rough | Gear Box Adj Stop 10:35 Gear Box |
| | 34 | | (Est 1/3 of hole) | | | | Start 10:40 |
| | | 41 min | 34.2 Quartzite White Hard Plan | | Milky | | 34.68 B.O.H. Stop 10:45 |
| 497.4' | | | Bottom of Rock Socket | | | | Plan B.O.H. 497.9' el. |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 5 OF 6 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION H101-P1-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 1 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method: Rotary | | | | 16 DATE HOLE | | 17 STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-------------|-------------|------------|---|------------|-------------|--------------|--|
| 30 | | | | | | | |
| 31 | | | | | | | |
| 32 | | | | | | | |
| 33 | | | | | | | 8 Additional feet drilled below plan avg. to clay cavern in rock socket |
| 34 | | | | | | | |
| 497.4' | | | | | | | |
| 35 | 13 min | | 50% Dolomite - Buff - Grey - Mod Hard 50% Quartzite - Milky White - Hard | | | | 8/7/81 (el) 547.55 Start 10:42 2nd 17rpm w/H2O Reverse Rotary 97.5 Stem - Kelly - DHA @37.5 4th 27rpm |
| 36 | 30 min | | | | | | |
| 36.1 | | | Dolomite - Buff - Grey Mod Hard | | Brown | Smooth | |
| 37 | 50 min | | | | | | |
| 37.2 | | | Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic | | | | |
| 38 | 1 hr 24 min | | | | Milky Brown | | |
| 38.6 | | | Dolomite - Buff - Mod Hard | | | | |
| 39 | 1 hr 1 min | | | | | | |
| 39.2 - 39.3 | | | Vuggy - Calcite filled (in above Dolomite) | | | | |
| 40 | 41 min | | | | | | |

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|--|--|---|---|--------------------|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | | Sheet 1 of 3 SHEETS |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION H101-P2-West-Socket | | 11 Elevation of Bottom of Hole 411.7 | | | |
| 3 Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO. | | 13 Casing Record | | Depth 120.0' | Type 100.D. |
| 5 NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15 ELEVATION of Water 543.72 | | | |
| 7 Boring Method: Reverse Rotary | | 16 DATE HOLE | | STARTED 9/14/81 | COMPLETED |
| 8 DEPTH DRILLED INTO ROCK 27.3 | | 17 ELEVATION TOP OF HOLE 560.55 TO Platform | | | |
| 9 TOTAL DEPTH OF HOLE 29.4 | | 18 TOTAL CORE RECOVERY FOR BORING 411.1 TOG | | | |
| | | 19 SIGNATURE OF INSPECTOR 439.0 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|--------------------|
| 441.1 | | | | | | | 9/14/81 |
| | | 30 min | Chert - Brown Overburden Hard | | | | Start 9:41 |
| | 1 | 9 min | | | Milky Brown | Smooth | Lake Elev. 543.72' |
| | 2 | | CEMENT GROUT | | | | 1st 7rpm w/H2O |
| 439.0' | | | Average Top of Rock | | | | 176.3' stem - |
| | | 19 min | 1.6 Dolomite - Buff - Mod Hard - Slightly Frac | | | | kelly & DHASSY |
| | 3 | 27 min | 2.9 Dolomite - Buff - Pink Mod Hard - Slightly Silic - Slightly Frac | | | | @3.5 2nd 17rpm |
| | 4 | | | | | | @10.0 4th |
| | | 15 min | 4.3 Dolomite - Buff - Grey Mod Hard - Frac w/Fe Stained frac planes | | | | 27rpm |
| | 5 | | | | | | |
| | | 21 min | 5.8 - 6.2 Siltstone - Grey - Soft (est 1/8 of hole) balance above Dolomite | | | | |
| | 6 | | | | | | |
| | | 25 min | 6.2 Dolomite - Buff - Grey Mod Hard - Frac w/Fe Stained frac planes | | | | |
| | 7 | | | | | | |
| | | 24 min | | | | | |
| | 8 | | | | | | |
| | | 21 min | | | | | |
| | 9 | | | | | | |
| | | 30 min | 9.8 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | |
| 431.1 | 10 | | | | | | |

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|--|--|---|--|---|--|-----------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Maseman Construction Co. | | Sheet 2 of 3 | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 LOCATION H101-P2-West-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO. | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|---|
| 431.1 | 10 | | Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | Lake Elev. 543.72' |
| | 28 min | | | | | | 4th 27rpm w/H2O 176.3' |
| | 11 | | 11.4 Dolomite - Buff - Grey Mod Hard - Slightly Silic Frac w/Fe stained Frac planes | | | | stem - Kelly & DH Assy |
| | 41 min | | | | | | |
| | 12 | | | | | | |
| | 47 min | | | | | | |
| | 13 | | | | | | |
| | 45 min | | | | | | |
| | 14 | | 14.1 Dolomite - Grey - Mod Hard - Hard - Slightly Silic - Frac w/Fe stained frac planes | | | | |
| | 52 min | | | | | | |
| | 15 | | 15.2 Dolomite - Buff - Grey Mod Hard - Frac w/fe stained joints and frac | | | | 9/14/81 |
| 425.6' | 47 min | | | | | | 9/15/81 |
| | 16 | | | | | | Start 7:23 4th 27rpm w/H2O 176.3' |
| | 31 min | | | | | | stem - kelly & DH Assy |
| | 17 | | 17.4 Chert - Grey - Brown Hard | | | | H2O off @19.0 Pump repair |
| | 19 min | | | | | | |
| | 18 | | 18.5 Dolomite - Pink - Grey Hard - Silic Frac | | | | |
| | 18 min | | | | | | |
| | 19 | | | | | | |
| | 25 min | | | | | | |
| 421.1 | 20 | | | | | | |

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|--|--|----------------------------------|--|---|--|-----------------|-----------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Maesman Construction Co. | | Sheet 3 of 3 | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P2-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth | Type |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Pottery | | | | 16 DATE HOLE | | STARTED | COMPLETED |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|---|------------|----------------|--------------|--|
| 421.1 | 20 | | | | | | con't |
| | 20 min | | Dolomite - Pink - Grey Hard - Silic Frac | | | | 4th 27rpm No H2O 176.3' ster kelly & DH Ass H2O on @20.1 Stop 10:00 Mark Kelly Start 10:12 Stop 1:35 B.O.H |
| | 21 | | 21.2 Dolomite - Pink - Grey Mod Hard - Frac. | | | | |
| | 20 min | | | | | | |
| | 22 | | | | | | |
| | 28 min | | | | Milky Brown | Smooth | |
| | 23 | | | | | | |
| | 22 min | | 23.5 Quartzite - Milky White Hard | | | | |
| | 24 | | 24.0 Sandy Dolomite - Buff Pink - Hard - Silic | | | | |
| | 23 min | | 24.2 Dolomite - Pink Grey Mod Hard - Hard - Slightly Silic Frac. | | | | |
| | 25 | | | | | | |
| | 32 min | | | | | | |
| | 26 | | | | | | |
| | 23 min | | | | | | |
| | 27 | | 27.1 Quartzite - Milky White Hard | | | | |
| | 22 min | | 27.4 Chert - Brown - Hard | | | | |
| | 28 | | 27.8 Dolomite - Pink - Buff Hard - Silic - Slightly Frac | | | | |
| | 43 min | | | | | | |
| | 29 | | | | | | |
| | 25 min | | Bottom of Rock Socket | | | | |
| 411.7 | | | | | | | |

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|--|--------|----------------------------------|---|---|-------------|----------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 5 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION H101-P2-East-Socket | | | | 11 Elevation of Bottom of Hole 411.6' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth 115.2' Type 10.0D | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water 545.05 | | | |
| 7 Boring Method: Reverse Potary | | | | 16 DATE HOLE | | STARTED 9/4/81 COMPLETED 9/11/81 | |
| 8 DEPTH DRILLED INTO ROCK 40.08 | | | | 17 ELEVATION TOP OF HOLE 560.18 TO Platform | | | |
| 9 TOTAL DEPTH OF HOLE 40.08 | | | | 18 TOTAL CORE RECOVERY FOR BORING N/A TO Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 451.68 TOROCK | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 451.68 | | | | | | | |
| | 47 min | | Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic | | Milky Brown | Mod Smooth | 9/4/81 Lake Elev. 545.05' |
| 1 | | | .4 Chert - Grey - Hard | | | | Start 11:41 1st |
| | 12 min | | .8 Quartzite - Milky White Very Hard - Highly Siliceous | | | | 7rpm w/H2O 176.3 stem - kelly - DHA |
| 2 | | | 1.6 Dolomite - Buff - Soft Mod Hard - Weathered | | | | @.5 2nd 17rpm @5.5 4th 27rpm |
| | 13 min | | 2.8 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | Stop 2:34 Weld side plates on drill stem |
| 3 | | | | | | | |
| | 26 min | | 3.9 Chert - Grey - Hard | | | | |
| 4 | | | 4.1 Dolomite - Buff - Grey Mod Hard | | | | |
| | 30 min | | | | | | |
| 5 | | | | | | | |
| | 28 min | | 5.4 Dolomite - Grey - Mod Hard - Hard - Slightly Silic - Slightly Frac | | | | |
| 6 | | | 6.5 Dolomite - Buff - Grey Mod Hard - Hard - Silic | | | | 9/4/81 9/8/81 |
| | 31 min | | 7.2 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | Start 7:51 Lake Elev. 544.62' 4th |
| | 25 min | | | | | | 27rpm w/H2O 176.3 stem - kelly - DHA |
| 8 | | | 8.1 Dolomite - Buff - Mod Hard | | | | |
| | 54 min | | | | | | |
| 9 | | | | | | | |
| | 48 min | | 9.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac w/Fe stained Frac Planes | | | | |
| 10 | | | | | | | |
| 441.68 | | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET: 2 OF 5 | |
|---|-------|----------------------------------|---|---|----------------|---------------------|---|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P2-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Potary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 441.68 | 10 | 1 hr 17min | Dolomite - Buff - Grey Mod Hard Frac w/FE stained Fractured Planes 10.4 - 10.5 Shale - Black - Soft 10.5 | | | | 4th 27rpm w/H2O 176.5 stem kelly DH Assy Stop 3:50 Air Loss |
| | 11 | 2 hr 8min | Dolomite - Buff - Grey Mod Hard 11.0 - 11/1 Shaley Dolomite - Dark Grey - Soft 11.1 | | Milky Brown | Smooth | Start 5:01 Stop 5:20 @13. |
| | 12 | 1 hr 18min | Dolomite - Light Grey Mod Hard - Hard - Silic (Slightly) 12.7 | | | | |
| | 13 | 1 hr 24min | Dolomite - Light Grey - Mod Hard 13.2 | | | | |
| 437.98 | 14 | 1 hr 12min | Dolomite - Grey - Brown Hard- Very Hard - Highly Siliceous 13.5 | | | | 9/8/81 9/9/81 Start 7:30 Lake Elev. 544.44' |
| | 15 | 1 hr 10min | Dolomite - Light Grey Mod Hard 14.4 | | | | 176.3 stem - kelly & DH Assy 4th 27rpm w/H2O Stop 10:58 Chg cone bits 1.3' drop in ch Stop 17.8 |
| | 16 | 1 hr 2min | Dolomite - Grey - Green Mod Hard - Slightly Frac 14.8 | | | | |
| | 17 | 57 min | Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic 16.4 | | | | |
| 433.88 | 18 | 45 min | Dolomite - Buff - Grey Mod Hard - Slightly Fractured w/FE stained frac planes 17 | | | | 9/10/81 Start 8:53 Lake Elev. 544.26' |
| | 19 | 45 min | | | | | 4th 27rpm w/H2O 176.3 stem = kelly & DH Assy |
| 431.68 | 20 | | | | | | |

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|---|-----------|----------------------------------|--|---|-------------|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Hassman Construction Co. | | SHEET 3 OF 5 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOC 5N H101-P2-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Potary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 431.68 | 20 | | | | | | |
| | 44 min | | Dolomite - Buff - Grey Mod Hard - Slightly Frac w/FE stained frac planes 20.8 | | Milky Brown | Smooth | 9/10/81 Lake Elev. 544.26' |
| | 21 | | Dolomite - Buff - Mod Hard | | | | 4th 27rpm w/H2O 176.3 stem - kelly & DH Ass Stop 5:18 |
| | 45 min | | | | | | |
| | 22 | | | | | | |
| | 40 min | | | | | | |
| | 23 | | | | | | |
| | 49 min | | | | | | |
| | 24 | | | | | | |
| | 47 min | | | | | | |
| | 25 | | 25.2 Dolomite - Buff - Mod Hard - Slightly Fractured | | | | |
| | 36 min | | | | | | |
| | 26 | | 26.8 - 27.5 Chert - Grey - Brown Hard | | | | |
| | 36 min | | | | | | |
| | 27 | | 27.5 Dolomite - Light Grey Mod Hard | | Milky | | |
| | 47 min | | 27.8 Dolomite - Grey - Pink Mod Hard - Hard - Silic | | | | |
| | 28 | | 28.6 Dolomite - Grey - Hard Silic - Slightly Frac | | Milky Grey | | |
| 422.98 | 1 hr 4min | | | | | | |
| | 29 | | | | | | 9/11/81 Lake Elev 544.12 Start 7:25 4th 27rpm w/H2O 176.3' stem - kelly - & DHA |
| | 50 min | | | | | | |
| 421.68 | 30 | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Hassman Construction Co. | SHEET 4 OF 5 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION H101-P2-East-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 13 Casing Record | | Depth | Type | |
| 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water | | |
| 16 DATE HOLE | | STARTED | COMPLETED | |
| 17 ELEVATION TOP OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| 19 SIGNATURE OF INSPECTOR | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-----------|------------|--|------------|-------------|--------------|-------------------------------|
| 421.68 | 30 | | | | | | con't 9/11/81 |
| | 49 min | | Dolomite - Grey - Hard - Silic - Slightly Frac | | | | Lake Elev. 544.12 |
| | 30.9 | | | | Milky Grey | Smooth | 4th 27rpm w/H2O |
| | 31 | | Dolomite - Grey - Hard Silic - Slightly Frac w/Silica healed frac | | | | 176.3' stem - Kelly & DH Assy |
| | 1 hr 2min | | 31.2 Dolomite - Grey - Mod Hard - | | | | Stop 1:25 |
| | 32 | | 32.2 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | Weld Baffle on Disposal barge |
| | 44 min | | | | | | Start 1:35 |
| | 33 | | 33.1 Quartzite - Milky White Hard | | | | |
| | 59 min | | 33.6 Sandy Dolomite - Buff - Grey - Mod Hard - Friable | | | | |
| | 34 | | 33.8 Dolomite - Grey - Pink Hard - Silic | | | | |
| | 42 min | | 34.5 Dolomite - Grey - Pink Hard - Silic - frac w/Fe stained frac planes | | | | |
| | 35 | | | | | | |
| | 34 min | | | | | | |
| | 36 | | 36.0 Chert - Grey - Brown Hard | | | | |
| | 19 min | | 36.8 Dolomite - Buff - Hard Silic Frac w/Fe stained frac planes | | | | |
| | 37 | | 37.3 Dolomite - Buff - Mod Hard | | | | |
| | 55 min | | 37.8 Dolomite - Buff - Mod Hard - Slightly Frac w/Fe stained Frac Planes | | | | |
| | 38 | | | | | | |
| | 40 min | | | | | | |
| | 39 | | | | | | |
| | 41 min | | | | | | |
| 411.68 | 40 | | | | | | |

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|--|--|-------------------|--|---------------------------------------|--|------------------|--|
| HOLE LOG | | DACW 03-79-C-0015 | | Massman Construction Co. | | 5-015 | |
| Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF B-T | | | |
| H101-P2-East-Socket | | | | 11. Elevation of Bottom of Hole | | | |
| Geotechnical | | | | 12. MANUFACTURER'S DESIGNATION OF B-T | | | |
| 14. HOLE NO. | | | | 13. Casing Record | | Depth Type | |
| 15. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 16. DIRECTION OF HOLE | | | | 15. ELEVATION of Water | | | |
| <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> DEG FROM VERT | | | | 16. DATE HOLE | | | |
| 17. ELEVATION TOP OF HOLE | | | | 17. ELEVATION TOP OF HOLE | | | |
| 18. TOTAL CORE RECOVERY PERCENT | | | | 18. TOTAL CORE RECOVERY PERCENT | | | |
| 19. SIGNATURE OF INSPECTOR | | | | 19. SIGNATURE OF INSPECTOR | | | |
| ELEVATION | | D-111 | | CLASSIFICATION OF MATERIALS | | Water Drill | |
| 411.68 | | Rate | | Description | | Color Action | |
| 411.6 | | 9min | | Dolomite - Buff - Mod | | Milky Smooth | |
| | | | | Hard - Slightly Frac w/Fe | | Grey | |
| | | | | Stained frac planes | | 4th 2" rpm w/H2O | |
| | | | | | | 176.3' stem - | |
| | | | | | | Kelly & DH Assy | |
| | | | | | | Stop 4:20 | |
| | | | | | | B.C.H. | |

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|---|--|----------------------------------|--|---|--|--------------------------|--|
| LOGGING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Maseman Construction Co. | | SHEET 1 OF 6 SHEETS | |
| Norfolk Lake Bridges | | | | 102" Smith-Rock | | | |
| 101-P3-W-Socket | | | | Elevation of Bottom of Hole 384.5' | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF CHILL Steven M. Hains | | | |
| HOLE NO. | | | | 13 Casing Record | | Depth 121.0' Type 10" CD | |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 548.69' 6/19 | | | |
| Drilling Method: Reverse Rotary | | | | 16 DATE HOLE STARTED 6/19/81 COMPLETED 7/2/81 | | | |
| DEPTH CHILLED INTO ROCK 50.3' | | | | 17 ELEVATION TOP OF HOLE 558.11 TOP | | | |
| TOTAL DEPTH OF HOLE 53.8' | | | | 18 TOTAL CORE RECOVERY FOR BORING 438.3 TOG | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 434.8 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|------------|---|------------|-------------|---------------|---|
| 438.3' | | | OVERBURDEN | | | | 6/19/81 Start 2:09 1st 7rpm w/H2O 186.7' stem- Kelly & DH Assy Stop 3:14 Weld on lugs Start 3:53 @6.0 2nd 17rpm with H2O Stop @6.2-5:06 |
| | 13 min | | | | Muddy | Smooth | |
| | 24 min | | CEMENT GROUT | | | | |
| | 6 min | | OVERBURDEN | | | Rough | |
| 434.8' | 12 min | | 3.5' ← Actual Top of Rock Chert - Grey - Hard | | | | |
| | 4.2 min | | Siltstone Pod - Yellow Soft (est 1/3 of hole) Balance Chert | | Yellow | | |
| | 4.8 min | | Dolomite - Very Hard Pink - Grey - Highly Siliceous (est 1/2 of hole) Balance Siltstone - Yellow - Soft | | | | |
| 432.1' | 5.6 min | | Siltstone - Yellow - Soft - (all of hole) | | | | 6/19/81 6/20/81 |
| | 6.0 min | | Dolomite - Very Hard - Pink - Grey - Highly Siliceous (est 1/3 of hole) Siltstone - Yellow Soft (est 2/3 of hole) | | | Mod Smooth | Lake Elev 548.64 Start 7:28 1st 7rpm w/H2O 186.7' stem - Kelly - & DH Assy @7:37 2nd 17rpm @9.0 1st 7rpm H2O off @9.0 2nd 17rpm w/H2O |
| | 7.0 min | | Sand - Well Rounded - Silica & Unconsolidated (est 1/3 of hole) | | | | |
| | 8.2 min | | Dolomite - Grey - Hard Slightly Silic with Siltstone Pod (est pod 1/8 of hole) | | | | |
| | 9.8 min | | Chert - Tan & Pink - Hard | | | | |
| 428.3' | 10 | | | | | Smooth | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 2 of 6 sheets | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 101-P3-W-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO | | | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| DEPTH DRILLED INTO ROCK | | | | 18 TOTAL COST RATCHERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|--------------|--------------|---------------------|
| 428.3 | 10 | | Chert - Tan - Pink - Hard | | | Smooth | 2nd 17rpm w/H2O |
| | | 51 min | 10.7 | | Milky | | 186.7' stem- |
| | 11 | | Siltstone Pod - Yellow Soft (est 1/4 of hole) | | | Mod Smooth | Kelly & DH Assy |
| | | 1 hr 5min | Balance - Chert - Hard Tan - Pink | | | | @10.7 1st 7rpm |
| | | | 11.3 | | | | No H2O |
| | 12 | | Dolomite - Pink - Grey Hard - Silic (Siltstone Pod Continues) | | Yellow Brown | Smooth | Stop 3:06 |
| | | 2 hr 36min | 12.7 | | | | |
| 425.3 | 13 | | Dolomite - Grey - Pink Very Hard - Silic with small Cavern (est 1/3 of hole) Sand - Silt & Siltstone Filled | | Milky | Very ROUGH | 6/20/81 |
| | | 2 hr 4min | 13.3 | | | | 6/22/81 |
| | 14 | | Dolomite - Grey - Pink Hard - Silic | | Yellow Brown | Mod ROUGH | Start |
| | | 1 hr 21min | 14.4 | | | | Lake Elev. 548.3' |
| | 15 | | Siltstone Pod (est 1/4 of hole) Yellow - Soft in above Dolomite | | | | 1st 3rpm No H2O |
| | | 58 min | | | | | 186.7' stem - |
| | 16 | | | | | | Kelly & DH Assy |
| | | 46 min | | | | | @13.3 7rpm |
| | 17 | | | | | | Stop 10:45 Air Leak |
| | | 44 min | | | | | Start 10:56 |
| | 18 | | | | | | @16.0 2nd 17rpm |
| | | 43 min | 18.4 Dolomite - Buff - Grey Mod Hard - Siltstone Pod Continues | | | | No H2O |
| | 19 | | | | | | |
| | | 33 min | | | | | |
| 418.3 | 20 | | | | | | |

| | | | | | | | |
|---|--|---|--|--|--|--------------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 of 6 SHEETS | |
| Norfolk Lake Bridges | | | | 10 ELEVATION OF BOTTOM OF HOLE | | | |
| 101-P3-W-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| Geotechnician | | | | 13 Casing Record | | Depth Type | |
| 14 TOTAL NUMBER CORE BOXES | | | | 15 ELEVATION of Water | | | |
| 16 DATE HOLE STARTED COMPLETED | | | | 17 ELEVATION TOP OF HOLE | | | |
| 18 TOTAL CORE RECOVERY FOR BORING | | | | 19 SIGNATURE OF INSPECTOR | | | |
| 20 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|-------------|---|------------|--------------|--------------|--|
| 418.3' | 20 | 34 min | Dolomite - Buff - Grey Mod Hard - with Siltstone Pod (est 1/4 of hole) Yellow & Soft | | Yellow Brown | Mod Rough | 2nd 17rpm No H2O 186.7 stem Kelly & DH Assy |
| | 21 | 36 min | | | | | |
| | 22 | 39 min | 22.8 Dolomite - Buff - Grey Mod Hard and Siltstone Buff - Pink - Very Soft (est 1/3 of hole) | | Milky Brown | | 6/22/81 6/23/81 Start 7:21 Lake Elev. 548.82 2nd 17rpm No H2O 186.7 stem Kelly & DH Assy H2O on 24.4' Stop 1:49 229.2' Air Leak |
| 415.3' | 23 | 1 hr 19 min | | | | | |
| | 24 | 46 min | | | | | |
| | 25 | 48 min | 25.5 Dolomite - Buff - Grey Mod Hard - Slightly Fractured with Iron Stains - Stained Frac Planes | | | Smooth | |
| | 26 | 50 min | 26.7 Dolomite - Grey - Pink Mod Hard - Hard - Siliceous Slightly Frac | | | | |
| | 27 | 1 hr 2 min | 27.5 Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous - Slightly Frac. | | Milky | | |
| | 28 | 1 hr 23 min | 28.6 Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous | | | | |
| 409.1' | 29 | | | | | | |
| 100.2' | 30 | | | | | | |

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PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

| | | | | | |
|--|--|----------------------------------|---|--|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | | SHEET 4 OF 6 SHEETS |
| Norfolk Lake Bridges | | | | | |
| LOCATION 101-P3-W-Socket | | | | | |
| Geotechnician | | | | | |
| HOLE NO. | | | | | |
| NAME OF DRILLER | | | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | | |
| Boring Method: Rotary | | | | | |
| DEPTH DRILLED INTO ROCK | | | | | |
| TOTAL DEPTH OF HOLE | | | | | |
| 10 SIZE AND TYPE OF BIT | | 11 Elevation of Bottom of Hole | | 12 MANUFACTURER'S DESIGNATION OF DRILL | |
| 13 Casing Record | | Depth | | Type | |
| 14 TOTAL NUMBER CORE BOXES | | | | | |
| 15 ELEVATION of Water | | | | | |
| 16 DATE HOLE STARTED COMPLETED | | | | | |
| 17 ELEVATION TOP OF HOLE | | | | | |
| 18 TOTAL CORE RECOVERY FOR BORING | | | | | |
| 19 SIGNATURE OF INSPECTOR | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 408.3 | 30 | | | | | | 5/25/81 |
| 408.2 | | | | | | | 6/25/81 |
| 408.0 | | 1 hr 59min | Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous 30.5 | | Milky | Mod Smooth | Start 4:35 186.7 stem - Kelly & DH Assy Lake Elev 548.7 |
| | 31 | | Dolomite - Grey - Pink Hard - Very Hard - Siliceous - (est 50%) Chert - Brown - Pink Hard 31.5 | | | Mod Rough | 6/26/81 Start 7:09 @30.3' 186.7' stem - Kelly & DH Assy with H2O 2nd 17rpm @32.5 1st 7rpm Stop 12:11 @34.2 |
| | 32 | 59 min | Siltstone Pod - Yellow Soft - (est < 1/8 of hole) in above rock 32.2 | | Brown | Rough | |
| | 33 | 48 min | Dolomite - Grey - Pink Hard - Silic (est 2/3 of hole) & Siltstone - yellow - Brown - Very Soft (est 1/3 of hole) 33.8 | | | | |
| | 34 | 48 min | Dolomite - Light Grey Hard - Siliceous - Massive (est 1/4 of hole) Siltstone - Yellow - Brown - Very Soft (est 1/4 of hole) 35.9 | | | Very Rough | 6/26/81 6/28/81 Can fell 1.15' 6/25/ While Drilling Start @35.35' 6/29 Add 7.5 can - 20' Kelly |
| CAN DROP | 35 | 1 hr 29min | Dolomite - Light Grey Hard - Silic - Massive (est 1/4 of hole) & Chert Grey - Brown (est 1/4 of hole) & Siltstone - Yellow - Very Soft (est 1/4 of hole) 36.3 | | | | 6/29/81 Start 12:18 @35.35 1st 7rpm NoH2O 206.7' Stem - Kelly DH Assy Stop 1:02 Tighten Kelly bolts Start 1:18 36' @2:03 Stop @2:03 Table OK Start 4:24 Stop 4:44 Table check |
| | 36 | 20min | Siltstone - Pod (in above Dolomite) Yellow - Soft (est < 1/8 of hole) 38.9 | | | | 6/30/81 .2' can drop 6/29/81 Start 6/30/81 38:29 1st gear 7rpm NoH2O 206.7 stem - Kelly & DH Assy Lake Elev 548.7 |
| CAN DROP | 37 | 1 hr 21min | Dolomite - Grey - Pink Hard - Very Hard - Slightly Frac Silica Healed Frac. 37.5 - 38.1 | | Milky Brown | Mod Smooth | 6/30.1 2nd 12rpm |
| | 38 | 1 hr 49min | Siltstone - Pod (in above Dolomite) Yellow - Soft (est < 1/8 of hole) 38.9 | | | | |
| | 39 | 50 min | Dolomite - Grey - with Buff Iron Stains - Mod Hard | | | | |

| | | | | |
|--|--|--|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 5 OF 6 SHEETS |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION 101-P3-W-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| HOLE NO. 1 | | 13 Casing Record Depth Type | | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE VERTICAL <input type="checkbox"/> DEG FROM VERT | | 15 ELEVATION of Water | | |
| Boring Method: Rotary | | 16 DATE MOLE STARTED COMPLETED | | |
| DEPTH CHILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|------------|------------|---|------------|-------------|--------------|---|
| 398.3' | 40 | | | | | | |
| | 1 hr 9min | | Dolomite - Grey - w/Buf Iron Stains - Mod Hard 40.6 - 41.9 Siltstone Pod in above Dolomite - Buff - White Soft (est 1/8 of hole) | | Milky Brown | | Stop 11:13 Tighten kelly bolts Start 11:24 H2O on @39.0 |
| | 41 | | | | | | 2nd 17rpm w/H2O 206.7' stem - kelly & DH ASSY Lake Ele/548.81 |
| | 1 hr 11min | | | | | Mod Smooth | Stop 4:16 @44.3' |
| | 42 | | 42.1 Dolomite - Dark Grey Mod Hard - Massive 42.3 Dolomite - Dark Brown Mod Hard - Massive 43.4 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic with Silic healed frac. | | | | |
| | 1 hr 2min | | | | | | |
| | 43 | | | | Milky | | |
| | 58 min | | | | | | |
| 394.0' | 44 | | | | | | |
| | 1 hr 19min | | | | | | 6/30/81 |
| | 45 | | | | | | 7/1/81 |
| | 1 hr 8min | | | | | | Start 7:27 2nd 17rpm w/H2O 206.7' stem kelly & DH Assy Lake Elev 548.87 |
| | 46 | | 46.1 Dolomite - Brown - Mod Hard - Hard - Massive - Slightly Silic 46.6 Dolomite - Buff - Mod Hard - Slightly Frac with Iron Stains | | | | |
| | 1 hr 12min | | | | | | |
| | 47 | | | | Milky Brown | | |
| | 35 min | | | | | | |
| | 48 | | | | | | |
| | 1 hr | | | | | | |
| | 49 | | 49.2 Dolomite - Buff - Mod Hard with Iron Stains | | | | |
| | 1 hr 20min | | | | | | |
| 388.3' | 50 | | | | | | |

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|--|--|---|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 6 OF 6 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 LOCATION 101-P3-W-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|--|
| 388.3' | 50 | 1 hr 37min | Dolomite - Buff - Mod Hard with Iron Stains | | Milky Brown | | 2nd 17rpm w/ H2O 206.7 stem - kelly DH Assy Stop 3:46 Check Can Elev. Start 3:50 Stop 4:55 Air Leak |
| | 51 | 1 hr 22min | 51.2 Dolomite - Buff - Grey Mod Hard Buff with Iron Stains | | | Mod Smooth | 7/1/81 7/2/81 Lake Elev. 548.93 Start 9:03 2nd 17rpm w/H2O 206.7' stem - kelly & DH Assy Stop 10:37 Grease swivel Start 10:46 Stop 11:31 B.O.H. (plan BOH 385) |
| 386.2' | 52 | 1 hr 41min | | | Milky | | |
| | 53 | 45 min | 53.1 Dolomite - Buff - Grey Mod Hard - Buff with Fe Stains & Slightly Frac Bottom of Rock Socket | | | | |
| 384.5' | | | | | | | |

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|---|--|----------------------------------|--|--|--|------------------------|--|
| Drilling Log | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 1 of 6 sheets | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| LOCATION 101-P3-East-Socket | | | | 11 Elevation of Bottom of Hole 384.9' | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| HOLE NO | | | | 13 Casing Record Depth 121 | | Type 10 CD | |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 548.8' | | | |
| Eoring Method: Reverse Rotary | | | | 16 DATE HOLE STARTED 7/7/81 COMPLETED 7/7/81 | | | |
| DEPTH DRILLED INTO ROCK 53.0' | | | | 17 ELEVATION TOP OF HOLE 558.64 & 557.64 TOG | | | |
| TOTAL DEPTH OF HOLE 56.49' | | | | 18 TOTAL DEPTH RECOVERED FOR ROVING 441.39' TOG | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 436.19' TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|---|
| 441.39' | | | | | | | |
| | 1 | 26 min | OVERBURDEN | | | | Start 10:10 1st 7rpm w/H2O Muddy Smooth 186.7 Stem - Kelly & DH Ass |
| | 2 | 10 min | | | | | 6.7' 2nd 17rpm Stop 1:16 Table Repair |
| | 3 | 7 min | CEMENT GROUT | | | | Start 2:15 Stop 5:01 8.5 1' drop in can from 7-8' H2O Elev. 548.8' |
| 437.9' | 4 | 11 min | OVERBURDEN | | | | |
| | 5 | | Average Top of Rock (Plan) | | | | |
| 436.19' | 6 | 7 min | CLAY AND GRAVEL | | | | |
| | 7 | | Actual Top of Rock | | | | |
| | 8 | 33 min | 5.2' Dolomite - Grey - Hard Siliceous - Slightly Fractured | | Milky Brown | Mod Rough | |
| | 9 | 1 hr 25min | 6.1' Dolomite - Buff - Mod Hard - Hard - Slightly Silic | | | Mod Smooth | |
| | 10 | 1 hr 54min | 6.7' Dolomite - Grey - Mod Hard - Hard - Slightly Silic | | | Mod | |
| | 11 | | 7.0 - 7.1' (in above) Siltstone Pod - Yellow Soft -(Est 1/8 of hole) | | Milky | Rough | |
| 432.89' | 12 | 1 hr 55min | 7.1' Dolomite - Milky - Sandy Highly Siliceous - Very Hard | | | | 7/7/81 7/8/81 |
| | 13 | 2 hr 10min | 7.6 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic - Massive | | | Smooth | Start 7:18 2nd 17rpm w/H2O 186.7 stem - kelly & DH Ass Lake El. 548.9 |
| 431.39' | 14 | | | | | | 126 |

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|---|--|--|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Maseman Construction Co. | SHEET 2 OF 6 SHEETS |
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| 2 LOCATION H101-P3-East-Socket | | 11 Elevation of Bottom of Hole | | |
| 3 Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4 HOLE NO | | 13 Casing Record Depth Type | | |
| 5 NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15 ELEVATION of Water | | |
| 7 Boring Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | | |
| 8 DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| 9 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR TESTING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|---------------|--|------------|-------------|--------------|--|
| 431.39 | 10 | | | | | | |
| | 11 | 1 hr | Dolomite - Grey - Pink Mod Hard - Hard - Massive 10.1 Chert - Brown - Hard | | Milky | Smooth | 2nd 17rpm w/H2O 186.7 Stem - Kelly & DH Assy Lake El 548.81 Stop 5:27 20.0 |
| | 12 | 1 hr 12min | 11.6 Dolomite - Buff - Mod Hard - Hard - Slightly Silic - Massive | | | | |
| | 13 | 1 hr 7min | | | | | |
| | 14 | 43 min | 13.9 Dolomite - Buff - Mod Hard - Slightly Silic Slightly Fractured | | | | |
| | 15 | 35 min | | | | | |
| | 16 | 31 min | 15.8 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac. | | | | |
| | 17 | 34 min | | | | | |
| | 18 | 29 min | 17.7 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | |
| | 19 | 19 min | | | | | |
| | 20 | 18 min | | | | | |
| 421.39 | 20 | | | | | | |

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|---|--|---|--|--|--|--------------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Maseman Construction Co. | | SHEET 3 OF 6 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 1 LOCATION H101-P3-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 2 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 4 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Boring Method: Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 7 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | 18 TOTAL 1 1/2 SEC. TEST | |
| 8 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|--------------|--------------|--|
| 421.39 | 20 | | Dolomite - Buff - Grey Mod Hard - Slightly Frac. | | | | 7/9/81 Start 9:53 20.0' 2nd 17' min WH20 186.7 stem - kelly & DH Assy Stop 12:13 Gear Box Repair Start 12:45 |
| | 21 | 34 min | | | | | |
| | 22 | 30 min | | | | | |
| | 23 | 26 min | 22.7 Dolomite - Buff - (Fe Stained) & Grey - Mod Hard - Fractured | | | | |
| | 24 | 24 min | 23.8 Dolomite - Buff - Grey Mod Hard - Hard - Frac Slightly Silic | | | | |
| | 25 | 32 min | 24.9 Dolomite - Buff - Mod Hard - Frac. | | Milky Smooth | | |
| | 26 | 27 min | | | | | |
| | 27 | 18 min | | | | | |
| | 28 | 30 min | 27.6 Chert - Black-Hard 27.7 Dolomite - Grey - Mod Hard - Hard - Silic | | | | |
| | 29 | 34 min | 28.7 Dolomite - Light Grey Sandy - Mod Hard 29.5 Dolomite - Grey - Pink Mod Hard - Hard - Silic | | | | |
| | 30 | 23 min | Siltstone Pod - Yellow Soft (Est 1/4 of Hole) Mod Hard | | | | |
| 411.39 | 30 | | | | Milky Yellow | | 128 |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 4 OF 6 SHEETS | |
|--|------------|----------------------------------|---|--|-------------|------------------------|--|
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| LOCATION H101-P3-East-Socket | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 1 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 2 HOLE NO. | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 3 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 4 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 5 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 6 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 7 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 411.39' | 30 | | | | | | |
| | 25 min | | Dolomite - Grey - Pink Mod Hard - Hard - Silic Siltstone Pod - Yellow Soft (Est 1/4 hole) Mod Hard | | Milky | | 7/9/81 2nd 17rpm w/H2O 186.7 stem - kelly DH Assy Stop 3:42 Engine Check |
| | 31 | | 31.5 Chert - Brown - + Grey Hard | | Yellow Mod | Smooth | Start 3:35 32.0 1st 7rpm w/H2O Stop 4:41 Engine Check Start 5:2 |
| | 23 min | | 32.0 Dolomite - Pink - Grey Mod Hard - Hard - Silic (Slightly) | | Milky | | Stop 7/9/81 5:36 Broke kelly Bolt |
| | 32 | | and Siltstone Pod - Yellow Soft | | | Mod Rough | |
| | 38 min | | 32.4 (est 1/8 of hole) Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic and clay filled cavern (est 1/4 of hole) | | Red | Very Rough | 7/9/81 7/10/81 Start 9:08 1st 7rpm No H2O 206.7 stem - kelly & DH Assy Stop 9:30 Broken Kelly bolts Start 10:26 Stop 10:40 Gear Box out 33.8' Start 2:00 Stop 2:26 Broke Kelly bolt |
| 408.29' | 33 | | 33.5 Cavity - Continues - Siltstone - Filled - Yellow - Soft | | | | Start 4:01 Stop 4:03 Sheared K bolts |
| | 1 hr 17min | | 34.9 Chert - Brown - Grey - Hard - (est 9/10 of hole) and Siltstone - Yellow Soft - (est 10% of hole) | | Milky | | 7/13/81 Start 34.0' 1st 7rpm No H2O No Air 206.7' stem kelly & DH Assy Stop 9:14 Gear Box Adjustment Start 9:44 Stop 10:09 GRA Start 10:33 Stop 11:20 " Start 11:50 Stop 12:28 " Start 1:25 Stop 4:35 Broke Trunnion Bolt |
| 407.39' | 34 | | 36.0 Dolomite - Light - Grey Pink - Mod Hard - Hard Silic (slightly) | | Yellow | Mod Smooth | Start 5:15 35:35 2nd 17rpm w/H2O Stop 6:20 Engine Check 36.5 |
| | 5 hr 32min | | 36.2-36.5 Siltstone Pod - Yellow Soft - (Est 1/8 of hole) | | | | |
| | 35 | | 36.5 Chert - Grey - Brown Hard | | Milky | | |
| | 35 min | | 36.7 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic | | | | |
| | 36 | | 37.5 Dolomite - Buff - Grey Mod Hard w/Fe stains | | | | |
| 404.79' | 1 hr 13min | | 38.5 Dolomite - Buff - Grey Mod Hard - Slightly Frac. | | | | |
| | 37 | | 39.8 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac. | | | | |
| | 1 hr 7min | | | | | | |
| | 38 | | | | | | |
| | 43 min | | | | | | |
| | 39 | | | | | | |
| | 45 min | | | | | | |
| 401.39' | 40 | | | | | | |

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|--|--|--|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 5 OF 6 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION H101-P3-East-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| HOLE NO. | | 13 Casing Record Depth Type | | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15 ELEVATION of Water | | |
| Boring Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | | |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FROM BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|---------------|---|------------|-------------|---------------|---|
| 401.39 | 40 | | | | | | |
| | | 1 hr 5min | Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac. 40.95 - 41.0 Shale Seam - Black - Soft - Mod Hard 41.0 | | | | 7/14/81 2nd 17rpm w/H2O 206.7' stem - Kelly - DH Assy @42.0 4th 27rpm Stop 1:40 Tighten Bolts Start 1:52 @43.0 2nd 17rpm Stop 2:55 Air Leak |
| | 41 | 1 hr 3min | Dolomite - Buff - Dark Grey - Mod Hard - Hard Slightly Silic - Slightly Fractured 41.4 | | Milky | Mod Smooth | |
| | 42 | 42 min | Dolomite - Brown - Dark Grey - Hard - Silic - Slightly Fractured 43.1 | | | | |
| | 43 | 38 min | Dolomite - Grey - Hard Highly Siliceous - Slightly Frac. 44.3 | | | | |
| 396.99 | 44 | 1 hr 25min | Dolomite - Buff - Grey Mod Hard - Slightly Frac. 44.5 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic - Slightly Frac. 45.4 | | | | 7/14/81 7/15/81 Start 8:30 2nd 17rpm No H2O 206.7' stem - Kelly & DH Assy 4th 27rpm 9:25 44.9' @47.0 2nd 17rpm Stop 12:55 Weld Kelly bars Start 1:25 |
| | 45 | 50 min | Dolomite - Buff - Mod Hard = Frac w/Fe Stains 46.1 | | | | |
| | 46 | 1 hr 1min | Dolomite - Buff - Hard Frac w/Fe stained frac planes - Silic 47.3 | | | | |
| | 47 | 46 min | Dolomite - Buff - Mod Hard - Slightly Frac. Fe Stained 48.6 | | | | |
| | 48 | 1 hr 11min | Dolomite - Buff - Mod Hard - Fe Stained 49.0 | | | | |
| | 49 | 1 hr 30min | Dolomite - Buff & Grey Mod Hard & Hard - Grey Slightly Silic | | | | |
| 391.39 | 50 | | | | | | |

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| | | | | | | | |
|--|--|----------------------------------|--|---|--|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 6 OF 6 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P3-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Rotary | | | | 16 DATE MOLE | | 17 ELEVATION TOP OF MOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY LOW BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|---------------|--|------------|-------------|--------------|--|
| 391.39' | 50 | 1 hr | Dolomite - Grey - Buff Mod Hard & Hard - Grey Slightly Silic 30.5' | | Milky | Mod Smooth | 2nd 17rpm No/ H2O 206.7' stem kelly & DH Ass Stop 6:55 @53.5' |
| | 51 | | Dolomite - Grey - Hard Silic - Massive | | | | |
| | 50 min | | 51.9 | | | | |
| | 52 | | Dolomite - Grey - Buff Mod Hard - Hard - Grey Slightly Silic 52.6 | | | | |
| | 56 min | | Dolomite - Buff - Mod Hard - Hard - Slightly Frac - Slightly Silic Fe Stained 52.9 | | | | 7/15/81 |
| 387.89' | | 1 hr 28min | Dolomite - Grey - Hard Silic | | | | 7/16/81 |
| | 54 | | 54.8 | | | | Start 7:30 2nd 17rpm No/H2O 206.7' stem - kelly & DH Ass Stop 7:58 |
| | 55 | 1 hr 37min | Chert - Brown - Grey Hard 55.2 | | | | Platform elev check Start 8:03 |
| | | 44 min | Dolomite - Buff & Grey Mod Hard - Hard - Buff Slightly Silic | | | | Lake El 548.65 Stop 11:24 56.5' |
| | 56 | | | | | | BOH |
| 385.0' | | 39 min | Bottom of Rock Socket | | | | Plan BOH 385.0' |
| 384.9' | | | | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|--|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 4 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102 Smith-Rock | | | |
| LOCATION 101-P4-West Socket | | | | 11 Elevation of Bottom of Hole 399.61 | | | |
| 1 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 2 HOLE NO | | | | 13 Casing Record Depth 122.7 | | Type 10 O.D. | |
| 3 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 547.27 | | | |
| 7 Boring Method: Reverse Rotary | | | | 16 DATE HOLE 8/20/81 | | 17 ELEVATION TOP OF HOLE 558.61' TO Platform | |
| 8 DEPTH DRILLED INTO ROCK 35.6 | | | | 18 TOTAL CORE RECOVERED FOR BIT NO 437.21' TOR | | 19 SIGNATURE OF INSPECTOR 435.2' TOR | |
| 9 TOTAL DEPTH OF HOLE 37.60 | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|--------------|--------------|----------------------|
| 437.21 | | | | | | | |
| | | 12 min | SAND | | | | Start 8:45 |
| | 1 | | | | Muddy Brown | Mod Smooth | Lake Elev. 547.27 |
| | | 9 min | CEMENT GROUT | | | | 1st 7rpm w/H2O |
| | | | Gravel | | | | 186.3 stem- |
| 435.2 | 2 | | Average Top of Rock | | | | Kelly & DH Assy |
| | | 47 min | Dolomite - Buff - Mod Hard Fe Stained 2.3-2.5 | | | | Stop 9:19 Weld Kelly |
| | 3 | | Siltstone Pod - Yellow Soft (Est 1/4 of hole) 2.5 | | Milky Brown | Smooth | Start 10:50 |
| | | 49 min | Dolomite - Buff - Grey Mod Hard Fe Stained - Slightly Frac. 3.2 | | | | @30' 2nd 17rpm |
| | 4 | | Dolomite - Buff - Mod Hard - Fe Stained 4.3 | | | Mod Smooth | |
| | | 40 min | Siltstone Pod - Grey Buff - Soft (Est 1/8 of hole) in above Dolomite 4.5 | | | | |
| | 5 | | Dolomite - Buff - Grey Soft - Mod Hard - Soft Weathered 5.5 | | Milky yellow | | |
| | | 38 min | Dolomite - Buff - Grey Soft - Mod Hard Siltstone - Yellow - Soft (Est 1/8 of hole) | | | | |
| | 6 | | | | | | |
| | | 39 min | | | | Smooth | |
| | 7 | | | | | | |
| | | 36 min | 8.0 Chert - Dark Brown - Hard 8.4 | | | | |
| | 8 | | Dolomite - Buff - Soft Mod Hard (Est 1/3 of hole) | | Yellow | | |
| | | 26 min | Siltstone - Yellow - Soft (Est 2/3 of hole) | | | | |
| | 9 | | | | | | |
| | | 13 min | 9.8 Dolomite - Light Grey Mod Hard Frac. | | | | |
| 427.21 | 10 | | | | | | |

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|--|--|---------------------------------------|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 4 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION H101-P4-West - Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF MILL | | |
| HOLE NO. | | 13 Casing Record | Depth | Type |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water | | |
| Boring Method: Rotary | | 16 DATE HOLE | STARTED | COMPLETED |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE IN FEET FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|--|
| 427.21 | 10 | | Dolomite - Light Grey - Mod Hard - Frac | | | | 2nd 17rpm w/H2O 186.3 stem Kelly Down Hole Assy @14.0' 1st 2rpm @14.4 2nd 17rpm Stop 17.0' |
| | 11 | 15 min | | | Milky Brown | Smooth | |
| | 12 | 9 min | 12.2 Dark Chert - Brown - Hard - | | | | |
| | 13 | 9 min | 13.1 Chert - Grey - Hard Vuggy w/clay filled Vugs | | | | |
| | 14 | 4 min | 14.0 Chert - Grey - Hard (Est 1/2 of hole) Clay - Red - Soft (Est 1/2 of hole) | | Red | Mod Smooth | |
| | 15 | 17 min | 14.4 Chert - Brown - Hard 14.9 Dolomite - Light Grey - Mod Hard Frac. | | Milky Brown | Smooth | |
| | 16 | 26 min | 16.4 Siltstone Pod - Yellow Soft (Est 1/8 of hole) in above Dolomite | | | | |
| 420.21 | 17 | 16.8 | Dolomite - Buff - Grey Mod Hard Slightly Frac with Fe stained vugs & seams | | | | 8/21/81 Lake Elev. 547.27 |
| | 18 | 26 min | | | | | Start 7:35 @17.0 2nd 17rpm w/H2O 186.3 stem - Kelly - DH Assy 119.5 4th 27rpm |
| | 19 | 32 min | | | | | |
| | 20 | 19.3 | Dolomite - Buff - Grey Mod Hard - Hard - Slightly Frac w/Fe stained frac planes | | | | |
| 417.21 | 40 | min | | | | | |

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|---|-------|----------------------------------|---|--|----------------|------------------------|---|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 4 SHEETS | |
| Norfolk Lake Bridges | | | | 10 ELEVATION OF BOTTOM OF HOLE | | | |
| 1 LOCATION H101-P1-West-Socket | | | | 11 MANUFACTURER'S DESIGNATION OF HOLE | | | |
| 2 Geotechnical | | | | 12 Casing Record Depth Type | | | |
| 3 HOLE NO | | | | 13 TOTAL NUMBER CORE BOXES | | | |
| 4 NAME OF DRILLER | | | | 14 ELEVATION OF WATER | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 DATE HOLE STARTED COMPLETED | | | |
| 6 Boring Method: Rotary | | | | 16 ELEVATION TOP OF HOLE | | | |
| 7 DEPTH DRILLED INTO ROCK | | | | 17 TOTAL CORE RECOVERY PER CENT | | | |
| 8 TOTAL DEPTH OF HOLE | | | | 18 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 417.21 | 20 | | 20.0 Dolomite - Grey - Hard Silic - Frac w/Fe Stained Frac. Planes | | Milky Brown | Mod Smooth | 4th 27rpm w/H2O 186.3' stem - Kelly & DH Assy @20.5 2nd 17rpm @26.9 4th 27rpm Stop 4:19 28.0 |
| | 21 | 37 min | 21.2 Dolomite - Dark Grey - Hard - Silic - Slightly Frac. | | | | |
| | 22 | 52 min | 22.1 Dolomite - Light Grey Hard - Silic - Slightly Frac. | | | | |
| | 23 | 1 hr 11min | | | | | |
| | 24 | 1 hr 2min | | | | | |
| | 25 | 1 hr 10min | 24.4 Dolomite - Grey - Mod Hard Hard - Slightly Frac. Hard Silic | | | | |
| | 26 | 44 min | 24.9 Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous - Slightly Frac | | | | |
| | 27 | 25.4 1 hr 44min | 25.4 Chert - Rust Red - Hard 25.6 Dolomite - Light Grey Silic - Hard - Frac with Fe Stained Frac Planes | | | | |
| | 28 | 46 min | 26.2 Dolomite - Light Grey Hard - Very Hard - Highly Silic Fe Stained | | | | |
| 409.21 | 29 | | | | | | 8/21/81 8/22/81 Start 7:35 4th 27rpm w/H2O 186.3' stem - Kelly Down Hole Assy |
| | 30 | 41 min | 28.8 Dolomite - Light & Dark Grey - Hard - Very Hard Highly Silic-Light Grey Fe Stained | | | | |
| 407.21 | 30 | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 4 OF 4 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 11 Elevation of Bottom of Hole | | | |
| 2 LOCATION H101-P4-West-Socket | | | | 12 MANUFACTURER'S DESIGNATION | | | |
| 3 Geotechnician | | | | 13 Casing Record Depth Type | | | |
| 4 HOLE NO. | | | | 14 TOTAL NUMBER CORP. BORES | | | |
| 5 NAME OF DRILLER | | | | 15 ELEVATION of Water | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT. | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method: Rotary | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORP. RECOVERED | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 407.21 | 30 | | | | | | |
| | 31 | 34 min | Dolomite - Light & Dark Grey - Hard - Very Hard - Highly Siliceous - Light Grey Fe Stained 30.3 | | | | 4th 2" rpm w/H2O 186.3' Star - Kelly & DH Asst Stop 10:08 |
| | 32 | 39 min | Dolomite - Light - Dark Grey - Highly Siliceous 31.5 | | Milky Brown | Mod Smooth Adj. | Start 10:12 Stop 1:52 PM |
| | 33 | 43 min | Dolomite - Dark Grey - Hard - Very Hard - Highly Siliceous | | | | |
| | 34 | 35 min | 33.4-33.5 Chert - Brown & Grey - Hard 33.5 | | | | |
| | 35 | 44 min | Dolomite - Buff & Grey Hard - Very Hard - Highly Siliceous - Slightly Fractured | | | | |
| | 36 | 31 min | 35.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac. | | | | |
| | 37 | 45 min | 36.5 Dolomite - Grey - Mod Hard - Hard - Slightly Silic | | | | |
| 399.61 | 22 min | | Bottom of Rock Socket | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | Sheet 2 of 2 |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | |
| 1 LOCATION H101-P4-East-Socket | | 12 MANUFACTURER'S DESIGNATION OF HOLE | | |
| 2 Geotechnician | | 13 Casing Record Depth Type | | |
| 3 HOLE NO | | 14 TOTAL NUMBER CORE BOXES | | |
| 4 NAME OF DRILLER | | 15 ELEVATION of Water | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | |
| 6 Boring Method: Rotary | | 17 ELEVATION TOP OF HOLE | | |
| 7 DEPTH DRILLED INTO ROCK | | 18 TOTAL CORE RECOVERY FOR HOLE NO | | |
| 8 TOTAL DEPTH OF HOLE | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|---|
| 426.17 | 10 | | chert - Grey - Hard - Vuggy with Siltstone filled vugs | | | | 1st 7rpm w/H2O 186.3 stem-kelly Down Hole Assy |
| | 11 | 10 min | 10.8 Chert - Grey - Hard - Vuggy - with siltstone filled vugs (est 50% of hole) | | Yellow | | 212.8 H2O off Broke H2O line 212.8 2nd 17rpm Stop 2:58 213. Gear Box Adj |
| | 12 | 7 min | Dolomite - Grey - Mod Hard - Fractures (est 50% of hole) | | | Mod Rough | Start 4:13 2nd 17rpm Stop 4:14 14.0 1' drop in can. |
| | | 36 min | 12.3 Chert - Grey - Hard 12.7 Dolomite - Light Grey - Mod Hard - Hard - Slightly Silic - Fractured | | Milky Brown | | |
| 422.67 | 13 | 1 hr 17min | 13.4 Siltstone - Pod - Yellow Soft (est 1/2 of hole) Dolomite - Light Grey - Hard - Very Hard | | | Smooth | 8/25/81 Lake Elev 546.60 |
| | 14 | 32 min | Highly Siliceous - Slightly Fractured 14.2 Dolomite - Light Grey Pink - Hard - Very Hard | | Yellow | | 8/26/81 Start 7:10 2nd 17rpm 186.3 stem - Kelly - DH Assy Stop 7:40 engine check Start 8:10 Stop 8:45 Can drop add 7.5' |
| | 15 | 28 min | Highly Siliceous - Slightly Fractured | | Milky Brown | | Start 12:25 Stop 12:40 Engine check Start 12:45 |
| | 16 | 33 min | 16.2 Dolomite - Light Grey Hard - Very Hard - Highly Siliceous - Fractured with Fe Stained frac planes | | | | |
| | 17 | 34 min | 17.5 Dolomite - Grey - Mod Hard - Slightly Frac | | | | |
| | 18 | 13 min | 18.0 Dolomite - Grey - Mod Hard - Fractured with Fe stained frac planes | | | | |
| | 19 | 14 min | | | | | |
| 416.17 | 20 | | | | | | |

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|--|--|----------------------------------|--|--|----------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Hassman Construction Co. | | SHEET 04 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION H101-P4-East-Socket | | | 11 Elevation of Bottom of Hole | | |
| 1 Geotechnician | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4 HOLE NO. | | | 13 Casing Record Depth Type | | |
| 5 NAME OF DRILLER | | | 14 TOTAL NUMBER CORE BOXES | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT. | | | 15 ELEVATION of Water | | |
| 7 Boring Method: Pottery | | | 16 DATE HOLE STARTED COMPLETED | | |
| 8 DEPTH DRILLED INTO ROCK | | | 17 ELEVATION TOP OF HOLE | | |
| 9 TOTAL DEPTH OF HOLE | | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|------------|------------|--|------------|-------------|--------------|---------------------------------|
| 416.17 | 20 | | | | | | |
| | 12 min | | Dolomite - Grey - Mod Hard - Frac w/FE stained frac planes | | Milky | | 8/25/81 H2O Level 546.60' |
| | 21 | | | | Brown | Smooth | 2nd 17rpm w/H2O 186.3' |
| | 13 min | | | | | | stem - Kelly & DH assembly |
| | 22 | | | | | | @20.2' 4th 27rpm |
| | 12 min | | | | | | |
| | 23 | | | | | | |
| | 24 | | 23.5 - 23.7 Chert - Red & Brown - Banded - Hard | | | | |
| | 24 | | 23.7 Dolomite - Buff - Grey | | | | |
| | 1 hr 1 min | | Mod Hard - Hard - Slightly Silic | | | | |
| 411.17 | 25 | | | | | | 8/26/81 |
| | 37 min | | 25.6 Dolomite - Buff - Grey | | | | 8/27/81 Lake Elev. 546.42' |
| | 26 | | Mod Hard - Hard - Slightly Silic - Slightly Frac. | | | | Start 7:25 3rd 27rpm w/H2O |
| | 28 min | | | | | | 186.3' stem - Kelly - & DHA |
| | 27 | | | | | | |
| | 29 min | | 27.1 Dolomite - Mod Hard - Frac Buff - Grey - w/Fe Stained frac planes | | | | |
| | 28 | | | | | | |
| | 35 min | | 28.4 Dolomite - Buff - Pink Mod Hard - Hard - Slightly Silic - Slightly Frac. | | | | |
| | 29 | | | | | | |
| | 42 min | | | | | | |
| 406.17 | 30 | | 29.5 Dolomite - Light Grey Mod Hard - Hard - Slightly Silic | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 4 of 4 | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P4-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method: Potary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-------------|--------------|--|
| 406.17 | 30 | | | | | | |
| | | 51 min | Dolomite - Light Grey - Mod Hard - Hard - Slightly Silic | | | | 8/27/81 Lake Elev. 546.42' 3rd 27rpm w/H2O 186.3' stem - Kelly DH Assy Stop 2:46 BOH |
| | 31 | | 30.2 Dolomite - Buff - Pink' Mod Hard - Hard - Slightly Silic | | Milky Brown | Smooth | |
| | 32 | 39 min | | | | | |
| | | | 32.6 Dolomite - Grey - Mod Hard - Hard - Silic - Frac with FE stained frac planes | | | | |
| | 33 | | 33.1 Dolomite - Buff - Mod Hard - Hard - Slightly Silic | | | | |
| | | 50 min | | | | | |
| | 34 | | 34.2 Dolomite - Buff - Mod Hard | | | | |
| | | 36 min | | | | | |
| | 35 | | 35.0 Dolomite - Buff - Mod Hard - Slightly Frac. | | | | |
| | | 29 min | 36.1 Dolomite - Grey - Mod Hard - Slightly Silic Frac w/Fe stained frac planes | | | | |
| | 36 | | | | | | |
| | | 21 min | Bottom of Rock Socket | | | | Elev 400.00 Design BOH |
| 399.63 | | | | | | | |

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|---|--|--------------------------------------|--|---|--|--|--|---|--|------------------------------------|--|--|--|-------------------------------------|--|--|--|---------------------------------|--|
| Norfolk Lake Bridges | | H101-P5-W-Socket | | Robert Schmoker | | Don Uchtman | | X-VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> DEG FROM VERT | | Boring Method: Reverse Rotary | | 39.2 | | 41.45 | | | | | |
| 10 SIZE AND TYPE OF BIT 102" Smith - Rock | | 11 Elevation of Bottom of Hole 396.0 | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain | | 13 Casing Record Depth 122.5' Type 10 D.D. | | 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water 5/20 - 550.0 | | 16 DATE HOLE STARTED 5/20/81 COMPLETED 6/5/81 | | 17 ELEVATION TOP OF HOLE 562.35 TOP | | 18 TOTAL CORE RECOVERY FOR BORING 437.45 TOG | | 19 DATE OF INSPECTION 435.2 TOR | |
| ELEVATION | | DEPTH | | Drill Rate | | CLASSIFICATION OF MATERIALS (Description) | | Water Color | | Drill Action | | REMARKS | | | | | | | |
| 437.45 | | 5 min | | 1 | | CLAY - MOD AND SAND | | Muddy | | | | 5/20/81 Start 9:40 1st 7rpm w/H2O 186.5 Stem kel and DR Assy. H2O El. 550.0 Pl. 5 - 10:27 2nd 17rpm Stop 12:19 Slightly Mark Kelly Rough Start 12:24 | | | | | | | |
| 435.2 | | 53 min | | 2 | | CEMENT GROUT | | | | | | | | | | | | | |
| | | 17 min | | 3 | | Average Top of Rock Dolomite - Light Buff Hard Silic - Slightly Fractured | | Milky Brown | | | | | | | | | | | |
| | | 11 min | | 4 | | 3.6 Dolomite - Buff - Sft Mod Hard - Frac w/FE Stains | | | | | | | | | | | | | |
| | | 31 min | | 5 | | 4.5 Dolomite - Buff - Mod Hard - Frac w/FE Stains | | Rough | | | | | | | | | | | |
| | | 18 min | | 6 | | | | | | Smooth | | | | | | | | | |
| | | 13 min | | 7 | | 6.6 Dolomite - Buff - Mod Hard - Extremely Frac w/FE stains | | | | | | | | | | | | | |
| | | 11 min | | 8 | | | | | | | | | | | | | | | |
| | | 14 min | | 9 | | 8.8 Dolomite - Grey - Mod Hard Slightly Frac w/FE stains | | | | | | | | | | | | | |
| 427.45 | | 7 min | | 10 | | | | | | | | | | | | | | | |

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|----------------------------|--|----------------------------------|--|--|--|---------------|--|
| DRILLING LOG | | PROJECT NO. DACW 03-79-C-0055 | | Massman Construction Co. | | 1 of 5 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| HI 01-P5-W-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnical | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 13 Casing Record | | | | Depth | | Type | |
| 14 TOTAL NUMBER CORE BOXES | | | | 15 ELEVATION of Water | | | |
| 16 DATE HOLE | | | | STARTED | | COMPLETED | |
| 17 ELEVATION TOP OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 19 SIGNATURE OF INSPECTOR | | | | | | | |
| 20 TOTAL DEPTH OF HOLE | | | | | | | |

| DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Color | Drill Action | REMARKS |
|--------|------------|---|-------------|--------------|--|
| 427.45 | 10 | | | | |
| | 14 min | Dolomite - Grey - Mod Hard Slightly Frac w/FE stains | | | 2nd 17rpm w/H2O 186.5 Stem Kelly and DP Assy H2O el. 550.0 Stop 1:30 Engine Start 1:40 Check |
| | 11 | | | | |
| | 15 min | 11.6 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Frac w/FE stains | | Smooth | 7rpm w/H2O Stop 4:05 @18.5 |
| | 12 | | | | |
| | 22 min | | | | |
| | 13 | | | | |
| | 21 min | | Milky Brown | Rough | |
| | 14 | | | | |
| | 26 min | | | | |
| | 15 | 14.8 Dolomite - Light Buff Mod Hard - Frac w/FE Stains | | | |
| | 25 min | | | | |
| | 16 | | | | |
| | 24 min | | | | |
| | 17 | | | Smooth | |
| | 25 min | | | | |
| | 18 | | | | 5/18/81 5/19/81 |
| 418.95 | 42 min | Dolomite - Light Buff Mod Hard - Hard - Slightly Silic - Frac w/FE Stains | | | 5/18/81 5/19/81 Start 8:01 186.5 Stem Kelly DP Assy 2nd 17rpm w/H2O El. 550.03 @19.0 4th 27rpm |
| | 19 | | | | |
| | 23 min | | | | |
| 417.45 | | | | | 141 |

| | | | |
|--|--|-------------------------------------|--|
| PROJECT NO. 03-79-C-0345 | | Massman Construction Co. | |
| Norfolk Lake Bridges | | H101-P5-W-Socket | |
| Geotechnical | | Elevation of Bottom of Hole | |
| HOLE NO. | | MANUFACTURER'S DESIGNATION OF DRILL | |
| NAME OF DRILLER | | Casing Record Depth Type | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | TOTAL NUMBER CORE BOXES | |
| Boring Method: Rotary | | ELEVATION of Water | |
| DEPTH DRILLED INTO ROCK | | DATE HOLE STARTED COMPLETED | |
| TOTAL DEPTH OF HOLE | | ELEVATION TOP OF HOLE | |
| | | TOTAL CORE RECOVERY FOR BORING | |
| | | SIGNATURE OF INSPECTOR | |

| DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Consolidation) | Water Color | Drill Action | REMARKS |
|--------|------------|---|-------------|--------------|--|
| 417.45 | 20 | | | | |
| | 26 min | Dolomite - Light Buff - Mod Hard - Hard - Slightly Silic | Milky Brown | Smooth | 186.5' Stem Kelly DH Assy 4th 27rpm w/H2O el 550.03 @20.5 1st 7rpm |
| | 21 | 20.5-21.9 Frac w/FE stains Siltstone Pod - Yellow Soft (Est. 1/3 of hole) | | Very Rough | Stop 9:25 @21.5 Broke off stem 57.5 off bottom of hole 5/19/81 |
| 415.95 | 1hr 36min | Balance Dolomite - Buff & Pink' Hard - Very Hard - Highly Siliceous - Pink - Grey 21.9 | | | 5/21/81 Start 1:24 @21.5 1st 7rpm w/H2O 186.5 Stem Kelly DH Assy el 550.0 |
| | 26 min | Dolomite - Grey Hard - Siliceous - Frac w/FE Stains 22.6 | Milky Brown | Rough | Stop 2:00 gear box out @21.5 |
| 414.65 | 23 | Dolomite - Buff - Grey - Hard - Siliceous - Slightly Frac w/FE stains 23.0-23.2 | | Smooth | 5/27/81 Start 11:49 @21.5 el 550.3 |
| 413.95 | 39 min | Chert - Brown - Grey -Hard 23.2 | | Rough | 1st 7rpm w/H2O Stop 1:00 @22.8 Air loss on stem 5/28/81 |
| | 38 min | Dolomite - Buff - Pink Hard - Very Hard - Highly Siliceous - Slightly Frac | | | Start 10:07 @22.8 1st 7rpm w/H2O 186.5 Stem Kelly & DH Assy |
| | 25 | 25.0 Dolomite - Buff - Light Grey - Mod Hard - Hard Slightly Silic - Frac w/FE stained Frac planes 25.5 | | Smooth | Stop 10:29 Air Loss @23.5 6/2/81 |
| | 1hr 30min | Dolomite - Buff - Pink Hard-Very Hard - Highly Siliceous 26.8 | Milky | | Start 12:30 @23.5 1st 7rpm w/H2O 186.5 Stem Kelly & DH Assy el 550.0 |
| 410.45 | 1hr 15min | Dolomite - Buff - Hard Very Hard - Highly Siliceous - Slightly Frac. | | | @24.5 2nd 17rpm 1:10 @26.0 4th 27rpm Stop 4:10 @ 27.0 |
| | 27 | 28.2 Dolomite - Buff - Hard Very Hard - Highly Siliceous - intensely frac w/FE stained frac planes | | | 6/2/81 4/3/81 Start 7:32 @27.0 4th 27rpm w/H2O 186.5 Stem Kelly DH Assy el 555.0 @28.8 2nd 17rpm |
| | 34 min | | Milky Brown | | |
| | 29 | | | | |
| | 14 min | | | | |
| 407.45 | 30 | | | | |

| | | | | | | | |
|---|-----------|------------------------|---|-------------------------------------|---------------|--|--|
| Hole Log | | Project No. | | Norfolk Lake Bridges | | Hole S. 1000 | |
| DAGW 03-79-C-0055 | | Mason Construction Co. | | Hole S. 1000 | | | |
| Norfolk Lake Bridges | | | | Elevation of Bottom of Hole | | | |
| H101-P5-W-Socket | | | | Manufacturer's Description of Drill | | | |
| Casing Record | | | | Depth | | Type | |
| Name of Driller | | | | Total Number Core Boxes | | Elevation of Water | |
| Direction of Hole | | | | Date Hole | | Started | |
| Vertical <input type="checkbox"/> Inclined <input type="checkbox"/> Deg from Vert | | | | Elevation Top of Hole | | Completed | |
| Drilling Method: Rotary | | | | Total Core Recovery for Boring | | Signature of Inspector | |
| Depth Drilled into Rock | | | | Signature of Inspector | | | |
| Total Depth of Hole | | | | | | | |
| Elevation | Depth | Drill Rate | Classification of Materials (Description) | Water Color | Drill Action | Remarks | |
| 407.45 | 30 | | | | | | |
| | 28 min | | Dolomite - Buff - Hard Very Hard - Highly Siliceous - Intensely Frac w/FE stains on Frac Planes | | | 2nd 17rpm w/H2O 186.5 Stem - 8 Kelly & DH Assy el. 550.0 @33.8 11:08 | |
| | 31 | | 28.8 | | | 1st 7rpm | |
| | 21 min | | Dolomite - Buff - Hard - Very Hard - Highly Siliceous - Slightly Frac | | | Stop 11:15 Add 20' joint Start 12:57 | |
| | 32 | | | Milky Brown | Smooth | @34.0 206.5' Stem - Kelly & DH Assy | |
| | 18 min | | | | | 1st 7rpm w/H2O | |
| | 33 | | | | | Stop 3:14 Fuel drill eng | |
| | 22 min | | 33.8-35.1 Open Cavity (est. < 1/8 of hole) balance - Dolomite - Buff - Hard Very Hard - Siliceous | | | Start 3:42 Stop 4:12 Air Leak | |
| | 34 | | | | | | |
| | 1hr 1min | | | | Very Rough | | |
| | 35 | | 35.0 Cavity siltstone filled Yellow - Soft | | | | |
| | 34 min | | 35.1 Dolomite - Light Buff Buff - Pink - Hard - Very Hard - Siliceous Slightly frac | | Rough | | |
| | 36 | | 35.7 - 36.8 Siltstone Pod - White Soft - (est < 1/8 of hole) | | | | |
| | 39 min | | 36.4 Dolomite - Sandy - Siliceous - Hard - Buff Grey (sand well rounded) Siltstone Pod continues | | Very Rough | | |
| | 37 | | | | | | |
| | 1hr 7min | | | | | | |
| 399.45 | 38 | | 37.6 Dolomite - Buff - Brown Hard - Silic | | | 6/3/81 | |
| 399.15 | | | 38.2 Dolomite - Brown - Hard Silic & Sandy Dolomite Mod Hard - Siltstone Yellow - Soft - (est 1/8 of hole) | | | 6/4/81 Start 4:45 1st 7rpm w/H2O 206.5' Stem - Kelly & DH Assy el 549.16' | |
| | 39 | | 38.5 Dolomite - Buff - Hard Silic - fractures | | | Stop 5:05 338.3 6/5/81 Start 7:15 38.3 1st 7rpm No H2O 206.5 S-K&DH AS | |
| | 1hr 19min | | | | | | |
| 397.45 | 40 | | | | | | |

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el 549.16'

| DRILLING LOG | | Project No. DASH 02-72-C-0255 | | Company Wesport Construction Co. | | Hole No. SHEET 5 of 5 | |
|--|--------|----------------------------------|--|--|--------------|----------------------------------|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P5-W-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record Depth Type | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 Elevation of Water | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | H2O Color | Drill Action | | |
| 397.45' | 40' | 58 min | Dolomite - Buff - Hard Silic Fractures | | | 1st 7rpm NoH2O | |
| | | 40.3 | Dolomite - Mod Hard - Tan & Hard Brown - Silic Fractures | Milky Brown | Rough | 206.5' Stem - Kelly & DH Assy | |
| | 27 min | 39.9 | Dolomite - Sandy - Bottom of Rock Socket | | | Stop 10:30 BOH | |
| 396.0 | | | (well rounded) Mod Hard Hard - Tan - Pink | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 1 of 5 sheets | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102 Smith - Rock | | | |
| LOCATION 101-P5-East - Socket | | | | 11 Elevation of Bottom of Hole 395.8' | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Haines | | | |
| HOLE NO. | | | | 13 Casing Record Depth 122.5' | | Type 10.0'OD | |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water 449.85' | | 6/8/81 | |
| Boring Method: Reverse Rotary | | | | 16 DATE HOLE 6/8/81 | | COMPLETED 6/12/81 | |
| DEPTH DRILLED INTO ROCK 41.0 | | | | 17 ELEVATION TOP OF HOLE 561.31 TOP | | | |
| TOTAL DEPTH OF HOLE 43.71 | | | | 18 TOTAL CORE RECOVERY FOR BORING 439.51 TOG | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 437.7 TOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-----------|------------|---|-------------|-------------|--------------|--|
| 439.51 | | | SAND | | | | |
| | 42 min | | CEMENT GROUT | | | | |
| | 1 | | OVERBURDEN | | Muddy | Rough | Start 12:32 1st 7rpm w/H2O 186.5 |
| | 6 min | | | | | | Stem - Kelly - DH Assy 2nd 17rpm @1:07 @5' Stop 1:46 @2.5 Weld lugs on stem |
| 437.7' | | | Average Top of Rock | | | | Start 2:38 1st 7rpm @3.2 3:30 2nd 17rpm @4.0' 1st 7rpm No H2O @4.5 2nd 17rpm w/H2O Stop - 5:05 @5.5 |
| | 1 hr 3min | | Dolomite - Light Grey Very Hard - Highly Siliceous w/Pods of White Quartzite 2.5 | | Mod Rough | | |
| | 3 | | Dolomite - Buff - Mod Hard - Hard - Silic - Slightly Frac. 3.3 | Milky Brown | Very Rough | | |
| | 25 min | | Dolomite - Buff - Very Hard - Intensely Frac w/Fe stained frac planes Highly siliceous. 4.0 | | Mod Rough | | |
| | 4 | | Siltstone Pod - Yellow Soft (<1/8 of hole est) Balance above Dolomite 4.5 | | Rough | | |
| 434.01 | 46 min | | Dolomite - Grey - Hard Silic - Massive 5.9-6.0 | | | Smooth | 6/8/81 6/9/81 |
| | 6 | | Chert Seam - Brown - Hard 6.0 | | | | Start 7:24 1st 7rpm w/H2O 186.5 Stem - Kelly & DH Assy @6.4 8:04 2nd 17rpm @6.7 1st 7rpm @7.0 2nd 17rpm Lake Elev. 6/9/81 449.7' |
| | 47 min | | Dolomite - Buff - Grey Mod Hard - Hard - Grey Silic 6.4- | | Yellow | Rough | |
| | 56 min | | Dolomite --Grey-- Hard Silic 6.7-7.0 | Milky Brown | | | |
| | 8 | | Siltstone pod - Yellow Soft (est <1/8 of hole) in above dolomite 7.0 | | | | |
| | 19 min | | Dolomite - Grey - Hard Silic - Slightly Frac 7.9 - 8.1 | | Mod Smooth | | |
| | 9 | | Chert seam (<1/3 of hole) Brown Hard | | | | |
| | 23 min | | 8.1 Dolomite - Buff - Mod Hard - Hard - Frac w/Fe stains - Silic | | | | |
| 429.51 | 10 | | | | | | |

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|---|--|---|--|--------------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 5 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION H101-P5-East-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF CEMENT | | |
| HOLE NO. | | 13 Casing Record Depth Type | | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water | | |
| Drilling Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | | |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING 1 | | |
| SIGNATURE OF INSPECTOR | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|-----------------|--------------|---|
| 429.51 | 10 | | | | | | |
| | | 1 hr 4min | Dolomite - Buff - Silic Mod Hard - Hard - Frac w/FE Stains 10.4 | | Milky Mod Brown | Smooth | 2nd 17rpm - w/H2O 186.5 Stem Kelly & DH Assy |
| | 11 | | Dolomite - Light Buff Buff - Hard - Very Hard Frac w/FE stains - Highly Siliceous | | Milky White | Smooth | LK- EL 449.7' @12.9 - 1:36 4th 27rpm Stop 5:05 @16.4 |
| | 12 | | 12.1 Dolomite - Light Buff - Very Hard - Highly Siliceous - Slightly Frac | | | | |
| | 13 | 1 hr 33min | | | | | |
| | 14 | 45 min | 13.2 Dolomite - Light Buff Hard - Very Hard - Siliceous - Frac w/FE Stains | | | | |
| | 15 | 1 hr 1min | | | | | |
| | 16 | 1 hr 12min | 15.9 Dolomite - Grey - Hard Silic - Slightly Frac | | | | |
| 423.11 | | 1 hr 15min | | | | | 6/9/81 |
| | 17 | | 16.9 Dolomite - Light Buff FE Stained = Hard - Very Hard - Highly Siliceous - Slightly Frac | | | | 6/10/81 |
| | 18 | 1 hr 1min | | | Milky Mod Brown | Mod Rough | Start 7:51 @16.4 4th 27rpm w/H2O 186.5 Stem Kelly & DH Assy Stop 8:45 Engine Check Start 8:55 @16.9 2nd 17rpm EL. 6/9/81 Lake 449.55' |
| | 19 | 36 min | 18.0 Dolomite - Buff - Mod Hard & Light Buff - Hard - Silic Frac. | | | | |
| | | 53 min | | | | Rough | |
| 419.51 | 20 | | 19.8 Dolomite - Buff - Mod Hard - Massive | | | Mod SMOOTH | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 5 SHEETS | |
|--|------------|----------------------------------|---|---|-------------|------------------------|---|
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 1 LOCATION 101-P5-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 2 Geotechnical | | | | 12 MANUFACTURER'S DESIGNATION OF Casing | | | |
| 3 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 4 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Rotary Method: Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 7 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 8 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERED PER HOLE NO | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 419.51 | 20 | | Dolomite - Buff - Mod Hard - Massive | | | | 6/10/81 |
| | 50 min | | | | Milky Brown | Mod Smooth | 2nd 17rpm W/H2O 136.5 Stem - Kelly & DH Assy |
| | 21 | | 21.1 Dolomite - Buff - Mod Hard - Slightly Silic Slightly Frac w/FE Stains on Frac planes | | | | @12:10 - 20.2 4th 27rpm @25.2 2nd 17rpm Stop @26.0 Lake Elev. 449.55 |
| | 1 hr 8min | | | | | | |
| | 22 | | | | | | |
| | 1 hr 2min | | | | | | |
| | 23 | | 22.9 Dolomite - Grey - Mod Hard - Massive | | | | |
| | 44 min | | | | | | |
| | 24 | | | | | | |
| | 45 min | | | | | | |
| | 25 | | 25.2 Dolomite - Brown - Mod Hard - Massive | | | | |
| | 49 min | | | | | Rough | |
| 413.51 | 26 | | | | | | 6/10/81 |
| | 1 hr 16min | | 26.6 Dolomite - Buff - Grey Mod Hard - Slightly Frac w/FE Stained Frac | | | Smooth | 6/11/81 EL 449.55 Start 7:28 2nd 17rpm W/H2O 136.5 Stem - Kelly & DH Assy Lake Elev. 449.55 |
| | 58 min | | | | | | |
| | 27 | | | | | | |
| | 28 | | | | | | |
| | 47 min | | 28.9 Dolomite - Buff - Mod Hard - Massive | | | | |
| | 29 | | | | | | |
| | 41 min | | 29.5 Dolomite - Grey - Mod Hard - Slightly Frac w/FE Stained Frac planes | | | | |
| | 30 | | 29.7-29.8 Siltstone 175 gr. MOIS. Yellow Soft | | Yellow | | |

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|--|----------------------------------|--|----------------------------------|
| DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | Scale 1" = 4' or 5' sheets |
| Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | |
| 1 LOCATION H101-P5-East-Socket | | 11 Elevation of Bottom of Hole | |
| 2 Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | |
| 3 HOLE NO. | | 13 Casing Record Depth Type | |
| 4 NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water | |
| 6 Boring Method: Rotary | | 16 DATE HOLE STARTED COMPLETED | |
| 7 DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | |
| 8 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY PERCENTAGE | |
| | | 19 SIGNATURE OF INSPECTOR | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|--|------------|--------------|--------------|---|
| 409.51 | 30 | | | | | | |
| | 29 min | | Dolomite - Grey - Mod Hard - Slightly Frac w/FE stained Frac planes 30.1-30.4 | | Yellow | Mod | 6/11/81 Lake el 499.55 |
| | 31 | | Siltstone Pod - Yellow Soft (est 1/8 of hole) 30.4 | | Milky White | Smooth | 2nd 17rpm w/H2O 186.5 Stem-Kelly & DH Assy @34.0 |
| | 36 min | | Sandy Dolomite - White Mod Hard 31.7 | | | Rough | 1:34 4th 27rpm Stop 2:05 Add 20' piece of stem Start 3:31 |
| | 32 | | Dolomite - Buff - Mod Hard Fe Stained 31.0 | | Milky Yellow | | 2nd 17rpm w/H2O 206.5' Stem-Kelly & DH Assy Stop 3:56 @35.5 |
| | 43 min | | Sandstone - Soft - Friable - Hard - Massive 32.5 | | | Smooth | Air Leak |
| | 36 min | | Dolomite - Buff - Yellow Mod Hard - Slightly Frac. 33.7 | | Yellow | | |
| | 34 | | Dolomite - Buff - Yellow Mod Hard - Frac. 35.4 | | | | |
| | 31 min | | | | | | |
| | 35 | | | | | | |
| 404.01 | 38 min | | Silty Dolomite - Soft Mod Hard - Yellow Buff | | | Mod Smooth | 6/11/81 6/12/81 Lake EL 549.35' Start 12:01 |
| | 36 | | | | | | 2nd 17rpm w/H2O 206.5 |
| | 35 min | | | | | | Stem-Kelly-& DH Assy @38.0' |
| | 37 | | | | | | 1st 7rpm w/H2O @39.8 2nd 17rpm w/H2O |
| | 21 min | | | | | | |
| | 38 | | 37.9 Siltstone Pod - Soft Yellow (est <1/3 of hole) Goethite Clusters Balance Buff - Mod Hard Dolomite | | Orange | Very Rough | |
| | 15 min | | | | | | |
| | 20 min | | | | | | |
| 399.51 | 40 | | | | | Rough | |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|---------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 5 OF 5 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 1 LOCATION 101-P5-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 2 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 4 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Drilling Method: Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 7 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 8 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|---|
| 399.51 | 40 | | | | | | |
| | 10 min | | Dolomite - Mod Hard - Buff & Siltstone Pod - Yellow - Soft with Weathered Goethite - Soft (est Siltstone Pod 1/3 of hole) | | Orange | Rough | 2nd 17rpm w/H2O 206.5' Stem - Kelly & DH Assy @40.2 1st 17rpm w/H2O @41.5 2nd 17rpm w/H2O Stop 3:10 BCH |
| | 20 min | | Silty Dolomite - 50% Weathered - Soft & Silt stone 45% Soft & Weathered Goethite 5% est | | | | |
| | 30 min | | 41.5 Dolomite - Buff - Mod Hard | | Buff | Smooth | |
| | 43 | | | | | | |
| | 15 min | | | | | | |
| 395.8 | | | Bottom of Rock Socket | | | | |

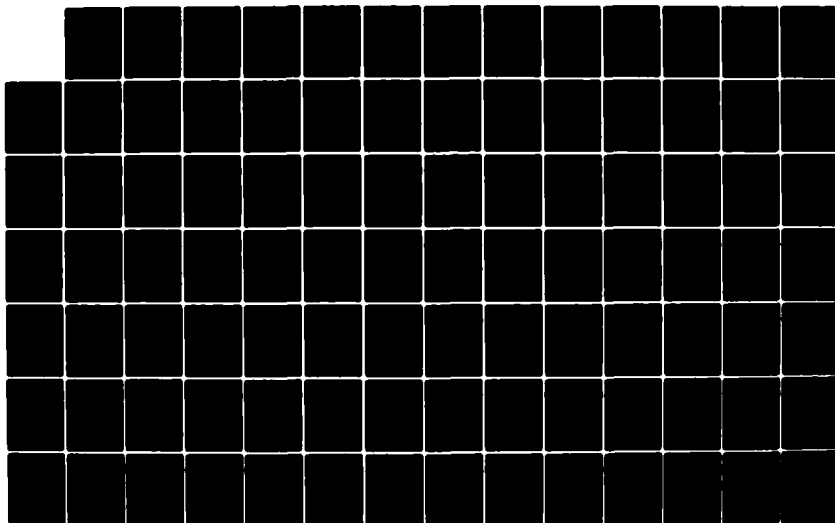
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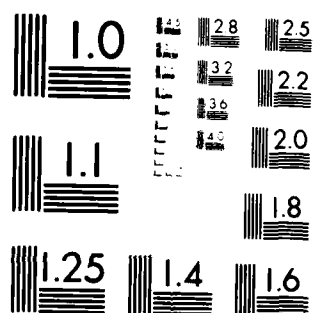
NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS
WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT
LITTLE ROCK ARK R L CRUTCHFIELD JUN 83

3/5

UNCLASSIFIED

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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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|--|--|---|---|-------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET: 1 of 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | |
| LOCATION H101-P6-West-Socket | | 11 Elevation of Bottom of Hole 419.2' | | |
| 1 Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | |
| 4 HOLE NO | | 13 Casing Record Depth 113.5' Type 10 OD | | |
| 5 NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15 ELEVATION of Water 10/5/81 542.1' | | |
| 7 Boring Method Reverse Rotary | | 16 DATE HOLE STARTED 10/5/81 COMPLETED 10/6/81 | | |
| 8 DEPTH DRILLED INTO ROCK 24.5' | | 17 ELEVATION TOP OF HOLE 557.83 TO Platform | | |
| 9 TOTAL DEPTH OF HOLE 27.33' | | 18 TOTAL CORE RECOVERY FOR BORING 446.53 TOG | | |
| | | 19 SIGNATURE OF INSPECTOR 443.7' TORock | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|--|
| 446.53' | | 4 min | SAND | | | | Start 2:32 Lake Elev. 542.1' 1st 7rpm w/H2O 156.3' |
| | 1 | 37 min | CEMENT GROUT | | Grey | Smooth | stem - kelly DH Asy @1.2 2nd 17rpm @3.0' 4th 27rpm Stop 5:20 |
| | 2 | 15 min | OVERBURDEN | | | | |
| 443.7' | | | Average Top of Rock | | | | |
| | 3 | 39 min | Dolomite - Buff - Mod Hard - Fe Stained 3.1 | | Milky | | |
| | 4 | 26 min | Dolomite - Light Grey Mod Hard 4.2 | | | | |
| | 5 | 28 min | Dolomite - Buff - Grey Mod Hard - Buff - Slightly Frac. 5.1 | | | | |
| | 6 | 26 min | Dolomite - Buff - Mod Hard Slightly Fractured | | Milky Brown | | |
| 440.03' | | | 6.7 - 6.8 Chert - Brown-Hard 6.8 | | | | 10/5/81 10/6/81 Start 7:13 Lake Elev. 541.91' |
| | 7 | 25 min | Dolomite - Buff - Mod Hard - Slightly Frac. 7.1 - 8.5 | | | | 4th 27rpm w/H2O 156.3' stem - kelly & DH Assembly |
| | 8 | 33 min | Chert - Brown - Grey Hard 8.5 | | | | |
| | 9 | 28 min | Dolomite - Brown - Hard Silic 8.8 | | Milky | | |
| | 10 | | Dolomite - Brown - Hard Silic - Frac with Fe Stained Frac Planes 9.4 | | | | |
| 436.53 | | | Dolomite - Grey - Hard Silic - Slightly Frac. | | | | |

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| | | | | |
|--|--|---|--|---|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| 1 LOCATION H101-P6-West-Socket | | 11 Elevation of Bottom of Hole | | |
| 2 Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4 HOLE NO | | 13 Casing Record Depth Type | | |
| 3 NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| 5 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15 ELEVATION of Water | | |
| 7 Boring Method Rotary sty | | 16 DATE HOLE 1 STARTED 1 COMPLETED | | |
| 8 DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| 9 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|---|------------|-------------|--------------|---|
| 436.53 | 10 | | | | | | |
| | 27 min | | Dolomite - Grey - Hard Silic - Slightly Frac 10.5 | | | | 4th 27rpm w/H2O 156.3' stem - kelly DH Assembly Stop 9:02 Smooth Grease Swivel Start 9:24 |
| | 11 | | Dolomite - Buff - Grey Mod Hard - Hard - Grey Silic 10.9 | Milky | | | |
| | 29 min | | Dolomite - Grey - Mod Hard | | | | |
| | 12 | | | | | | |
| | 26 min | | | | | | |
| | 13 | | 13.1 Sandy Dolomite - Milky White - Light Grey Mod Hard - Hard | | | | |
| | 35 min | | 13.5 Dolomite - Grey - Mod Hard | | | | |
| | 14 | | 14.6 Dolomite - Grey - Mod Hard - Slightly Frac. | | | | |
| | 26 min | | | | | | |
| | 15 | | | | | | |
| | 27 min | | | | | | |
| | 16 | | 16.4 Dolomite - Grey - Mod Hard - Frac with Fe Stained Frac Planes | | | | |
| | 16 min | | | | | | |
| | 17 min | | | | | | |
| | 18 | | 18.0 Dolomite - Buff - Mod Hard - Slightly Frac. | | | | |
| | 19 min | | 18.9 Dolomite - Light Grey Mod Hard | | | | |
| | 19 | | | | | | |
| | 18 min | | | | | | |
| 426.53 | 20 | | | | | | |

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| | | | | | | | |
|--|--------------|---|--|--|--------------------|--------------------------------------|---------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Hassman Construction Co. | | SHEET 3 of 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 1 LOCATION H101-P6-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 2 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth | Type |
| 3 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Rotary ary | | | | 16 DATE HOLE | | STARTED | COMPLETED |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 426.53' | 20 | | Dolomite - Grey - Mod Hard | | | | 4th 2/rpm w/H2 |
| | 17 min | | 20.3 - 20.4 Shale - Black - Soft | | | | 156.3' stem - kelly & DH Asy |
| | 21 | | 20.4 Dolomite - Grey - Mod Hard | | | | Stop 2:15 Add 20' stem |
| | 23 min | | 21.5 - 21.6 Shale - Black - Soft | | | | Start 3:10 |
| | 22 | | 21.6 Dolomite - Grey - Mod Hard | | | | 176.3' stem - kelly & DH Asy |
| | 22 min | | 22.2 Dolomite - Grey - Mod Hard | | | | Stop 4:42 BOH |
| | 23 | | Hard - Hard - Slightly Silic | | | | |
| | 26 min | | | | | | |
| | 24 | | | | | | |
| | 21 min | | 24.8 Dolomite - Grey - Mod Hard | | | | |
| | 25 | | | | | | |
| | 19 min | | | | | | |
| | 26 | | | | | | |
| | 18 min | | | | | | |
| | 27 | | | | | | |
| 419.2' | 7 min | | Bottom of Rock Socket | | | | 419.7 Design - Bottom of Socket |

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| | | | | | | | |
|---|--|---|--|--|--|-------------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION H101-P6-East-Socket | | | | 11 Elevation of Bottom of Hole 419.2' | | | |
| 3 Geotechnician Don Uchtman | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth 115.2 Type 100D | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION OF WATER 10/7/81 541.85 | | | |
| 7 Boring Method Revers Rotary | | | | 16 DATE HOLE 10/7/81 COMPLETED 10/8/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 24.6' | | | | 17 ELEVATION TOP OF HOLE 558.7' TO Platform | | | |
| 9 TOTAL DEPTH OF HOLE 26.61' | | | | 18 TOTAL CORE RECOVERY FOR BORING 445.81' TO G | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 443.8' TO Rock | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|---|------------|----------------|--------------|---|
| 445.81 | | 4 min | SAND | | Grey | | Start 2:44 1st 7rpm w/H2O 156.3' stem - Kelly & DH Assy Lake Elevation 541.85' 2nd 17rpm @2.5' @3.0' 4th 27rpm @5.0' 1st 7rpm H2O off 4th 27rpm @5.4' w/H2O Stop 5:15 @6.8' |
| | 1 | 10 min | Cement Grout | | | Smooth | |
| 443.80 | 2 | | Average Top of Rock | | | | |
| | | 17 min | Dolomite - Buff - Weathered - Soft | | Milky Brown | | |
| | 3 | 20 min | 2.9 Dolomite - Buff - Mod Hard | | | | |
| | 4 | 33 min | 3.5 Dolomite - Buff - Mod Hard - Slightly Frac 4.0 - 5.9 Chert - Brown & Grey - Hard | | | | |
| | 5 | 38 min | 5.9 Dolomite - Brown - Mod Hard - Hard - Slightly Silic - Slightly Frac | | | | |
| 439.01 | 6 | 47 min | | | | | |
| | 7 | 33 min | 7.2 Dolomite - Light Brown Mod Hard | | | | 10/7/81 10/8/81 Start 7:10 4th 27rpm w/H2O 156.3' stem - Kelly & DH Assy Lake Elev. 541.83' |
| | 8 | 40 min | 8.4 Dolomite - Light Grey Mod Hard | | | | |
| | 9 | 24 min | 9.7 - 9.9 Sandy Dolomite - Mod Hard - Hard 9.9 Dolomite - Grey - Mod Hard - Slightly Silic | | | | |
| 435.81 | 10 | | | | | | |

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|--|--|---|--|-------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION H101-P6-East-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 4 HOLE NO. | | 13 Casing Record Depth Type | | |
| 5 NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15 ELEVATION of Water | | |
| 7 Boring Method Rotary dry | | 16 DATE HOLE STARTED COMPLETED | | |
| 8 DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| 9 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|---|------------|---------------------|--------------|---|
| 435.81 | 10 | | | | | | |
| | 33 min | | Dolomite - Grey - Mod Hard - Slightly Frac | | | | 4th 27rpm w/H2O 156.3' stem - kelly DH Assembly H20 Level 541.83' Can Drop 75' Adj 11 & 12' |
| | 11 | | | | | | |
| | 13 min | | 11.4 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic | | | | |
| | 12 | | | | | | |
| | 25 min | | 12.2 Dolomite - Grey - Hard Silic | | | | |
| | 13 | | | | | | |
| | 13 min | | 13.0 Chert - Grey - Hard 13.3 Dolomite - Buff - Hard Silic - Slightly Frac | | Milky Smooth Yellow | | |
| | 14 | | | | | | |
| | 12 min | | 14.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | | |
| | 15 | | | | | | |
| | 18 min | | 15.5 Dolomite - Buff - Mod Hard | | | | |
| | 16 | | | | | | |
| | 11 min | | | | | | |
| | 17 | | | | | | |
| | 15 min | | | | | | |
| | 18 | | | | | | |
| | 14 min | | | | | | |
| | 19 | | | | | | |
| | 19 min | | 19.4 Dolomite - Buff - Grey Mod Hard | | | | |
| 425.81 | 20 | | | | | | |

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| | | | | | | | |
|---|--|---|--|--|--|-------------------------------|------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P6-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth | Type |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Rotary sty | | | | 16 DATE HOLE | | STARTED | COMPLETED |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|---|------------|--------------|--------------|--|
| 425.81 | 20 | | | | | | |
| | 16 min | | Dolomite - Buff - Grey Mod Hard 20.6 | | | | 4th 27rpm w/H2O Level |
| | 21 | | Dolomite - Grey - Mod Hard 21.1 | | | | 541.83' stem kelly - DH A Stop 12:10 |
| | 17 min | | Dolomite - Buff - Grey Mod Hard - Slightly Frac | | | Smooth | Add 20' kelly Start 1:05 |
| | 22 | | | | Milky Yellow | | 176.3' stem - kelly & DH Asy Stop 2:48 BOH |
| | 18 min | | | | | | |
| | 23 | | 23.2 Dolomite - Buff - Mod Hard | | | | |
| | 27 min | | | | | | |
| | 24 | | 24.1 Dolomite - Buff - Mod Hard - Slightly Frac. | | | Mod Rough | |
| | 18 min | | | | | | |
| | 25 | | | | | | |
| | 16 min | | | | | Smooth | |
| | 26 | | | | | | |
| | 8 min | | | | | | |
| 419.2' | | | Bottom of Rock Socket | | | | 419.7 Design Bottom of Socket |

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|---|--|---|--|--------------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | |
| LOCATION 101-P7-East-Socket | | 11 Elevation of Bottom of Hole 429.9' | | |
| Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | |
| HOLE NO. | | 13 Casing Record | Depth 100' | Type 10' O.D. |
| NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15 ELEVATION of Water 542.93 | | |
| Boring Method Reverse Rotary Box | | 16 DATE HOLE STARTED 11/11/81 COMPLETED 11/13/81 | | |
| DEPTH DRILLED INTO ROCK 24.9' | | 17 ELEVATION TOP OF HOLE 555.23' T.O. Platform | | |
| TOTAL DEPTH OF HOLE 27.83' | | 18 TOTAL CORE RECOVERY FOR BORING 457.73' T.O. Grout | | |
| | | 19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|--------------|---|------------|-------------|--------------|--|
| 457.73' | | | | | | | |
| | 1 | 5 Min. | Sand | | | | Start 2:32 1st-7RPM-w/H ₂ O 146.9' Stem- Kelly+D.H.Assy. @3.5' 2nd-17RPM Lake El. 542.88' |
| | 2 | 4 Min. | | | Brown | | |
| | 3 | 3 Min. | Cement Grout Ave Top of Rock | | | | |
| 454.8' | | | Dolomite-Light Grey-Mod. Hard-Buff-Slightly Frac. | | | | |
| | 4 | 31 Min. | | | | | |
| 453.73 | | | | | | | |
| | 5 | 1 Hr 15 Min. | @4.6'-Dolomite-Light Grey- Mod. Hard-Slightly Frac. | | Milky Brown | | 11/12/81 Start 2nd-17RPM-w/H ₂ O 146.9' Stem- Kelly+D.H.Assy. Lake El. 4th-27RPM @7:27 Lake El. 542.97' |
| | 6 | 55 Min. | | | | | |
| | 7 | 44 Min. | @6.5'-Dolomite-Buff- Grey-Mod. Hard-Frac w/ Stained Frac. Planes | | | | |
| | 8 | 43 Min. | @7.1'-Dolomite-Grey- Mod. Hard-Hard-Slightly Silic-Slightly Frac. | | | | |
| | 9 | 53 Min. | @8.8'-Dolomite-Grey- Mod. Hard-Slightly Frac. | | Milky Grey | | |
| | 10 | 49 Min. | | | | | |
| 447.73' | | | | | | | |

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|---|--|----------------------------------|--|---|--|--|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET: 2 of 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 1 LOCATION 101-P7-East-socket | | | | 11 Elevation of Bottom of Hole 430.1' | | | |
| 2 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 3 HOLE NO. | | | | 13 Casing Record | | Depth 100' Type 10" O.D. | |
| 4 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Boring Method Reverse Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE 555.23' T.O. Platform | |
| 7 DEPTH DRILLED INTO ROCK 24.7' | | | | 18 TOTAL CORE RECOVERY FOR BORING 457.73' T.O. Grout | | 19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock | |
| 8 TOTAL DEPTH OF HOLE 27.63' | | | | | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|------------|---|-------------|-------------|--------------|------------------------------|
| 447.73' | 10 | | Con't. | | | | Con't. 11/12/81 |
| | 45 Min. | | Dolomite-Grey-Mod. Hard-Slightly Frac. | | | | 4th-27RPM-w/H ₂ O |
| | 11 | | @10.9'-Dolomite-Brown-Hard-Silic | | | | 146.9' Stem-Kelly+D.H.Assy. |
| | 50 Min. | | @11.5'-11.6'-Chert-Brown-Hard | Milky Grey | | | Lake El. 542.92' |
| | 12 | | @11.6'-Dolomite-Grey-Hard-Silic-Slightly Frac. | | | | |
| | 53 Min. | | @12.5'-Chert-Brown-Hard | | | | |
| 444.53' | 13 | | @12.8'-Dolomite-Grey-Hard-Highly Siliceous | | | | 11/12/81 |
| | 52 Min. | | @13.5'-Dolomite-Light Brown-Mod. Hard-Frac w/ Silica Healed Fracs. | | | | 11/13/81 |
| | 14 | | @14.0'-Dolomite-Light Grey-Hard-Silic-Frac. w/ Fe Stained Frac Planes | | | | Start 7:18 |
| | 26 Min. | | @14.4'-Dolomite-Buff-Soft-Mod. Hard-Frac. - Weathered | | | | 4th-27RPM-w/H ₂ O |
| | 15 | | @15.2'-Dolomite-Buff-Grey-Mod. Hard | | | | 146.9' Stem-Kelly+D.H.Assy. |
| | 21 Min. | | | Milky Brown | | | Stop 8:10 |
| | 16 | | | | | | Lost Anchor |
| | 21 Min. | | @16.9'-Dolomite-Grey-Mod. Hard-Massive | | | | Start 8:14 |
| | 17 | | | | | | Lake El. 542.95' |
| | 43 Min. | | | | | | |
| | 18 | | | Milky Grey | | | |
| | 32 Min. | | | | | | |
| | 19 | | | | | | |
| | 31 Min. | | | | | | |
| 437.73' | 20 | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Hassman Construction Co. | | SHEET 3 of 3 SHEETS | |
|---|-------|----------------------------------|--|---|-------------|-------------------------|---|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 1 LOCATION 101-P7-East-Socket | | | | 11 Elevation of Bottom of Hole 430.1' | | | |
| 2 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 3 HOLE NO. | | | | 13 Casing Record | | Depth 100' Type 10'O.D. | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Reverse Rotary XXX | | | | 16 DATE HOLE | | 17 COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK 24.7' | | | | 11/11/81 | | 11/13/81 | |
| 9 TOTAL DEPTH OF HOLE 27.63' | | | | 17 ELEVATION TOP OF HOLE 555.23' T.O. Platform | | | |
| | | | | 18 TOTAL CORE RECOVERY FOR BORING 457.73' T.O. Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 437.73' | 20 | | Con't. | | | | Con't. 11/13/81 |
| | 21 | 21 Min. | Dolomite-Grey-Mod. Hard-Massive | | | | 4th-27RPMw/H. 20 |
| | 21 | | @20.3'-Dolomite-Dark Grey-Mod. Hard-Massive | | | | 146.9' Stem-Kelly+D.H.Assy. Stop 12:30 Add 20.2' Joint Start 1:14 167.1' Stem-Kelly+D.H.Assy. Lake El. 542.95' Stop 3:11 B.O.H. |
| | 22 | 22 Min. | | | | | |
| | 23 | 28 Min. | | | Milky Grey | | |
| | 24 | 33 Min. | | | | Smooth | |
| | 25 | 25 Min. | | | | | |
| | 26 | 38 Min. | | | | | |
| 430.6' | 27 | 21 Min. | | | | | Plan B.O.H. |
| 429.9' | | | Bottom of Rock Socket | | | | |

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|---|--|---|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | |
| LOCATION 101-P7-West-Socket | | 11 Elevation of Bottom of Hole 430.2' | | |
| Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | |
| HOLE NO. | | 13 Casing Record Depth 97.5' Type 10'O.D. | | |
| NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water 542.72 | | |
| Boring Method Revers Rotary XXX | | 16 DATE HOLE STARTED 11/6/81 COMPLETED 11/10/81 | | |
| DEPTH DRILLED INTO ROCK 24.6' | | 17 ELEVATION TOP OF HOLE 553.03' T.O. Platform | | |
| TOTAL DEPTH OF HOLE 25.33' | | 18 TOTAL CORE RECOVERY FOR BORING 455.53' T.O. Grout | | |
| | | 19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|------------|---|------------|-------------|--------------|------------------------------|
| 455.53' | | | | | | | |
| | 10 Min. | | Cement Grout | | | | Start-11:35 |
| 454.8' | | | Ave. Top of Rock | | Brown | | 1st-7RPM-w/H ₂ O |
| | 1 | | Siltstone-Yellow-Soft | | | | 146.9' Stem- |
| | | | @1.3' Dolomite-Buff-Grey-Mod Hard-Slightly Frac. | | Yellow | | Kelly+D.H.Assy |
| | 47 Min. | | | | | | Lake El. 542.72' |
| | | | | | | | @12:02-2nd-17RPM |
| | | | | | | | @12:23-1.8' 4th- |
| | | | | | | | 27RPM |
| | 2 | | | | | | |
| | 32 Min. | | @2.8' Dolomite-Buff Mod Hard | | Milky Brown | | |
| | 3 | | | | | | |
| | 29 Min. | | @3.9' Dolomite-Buff-Grey-Mod Hard-Slightly Frac w/Fe stained frac planes. | | | Smooth | |
| | 4 | | | | | | |
| | 33 Min. | | @4.6' Dolomite-Grey-Mod Hard-Hard-Slightly Silic. | | | | |
| | 5 | | | | | | |
| | 29 Min. | | @5.4' Dolomite-Grey-Mod Hard. | | | | |
| | 6 | | | | | | |
| | 27 Min. | | @6.3' Dolomite-Grey-Mod Hard-Slightly Frac w/Fe Stained frac planes. | | | | |
| | 7 | | | | | | |
| 448.03' | 30 Min. | | @7.4' Dolomite-Buff-Grey-Mod Hard-Slightly Frac. | | | | 11/6/81 |
| | 8 | | | | | | 11/9/81 |
| | | | | | | | Start-7:09@7.5' |
| | | | | | | | 4th-27RPM-w/H ₂ O |
| | | | | | | | 146.9' Stem- |
| | 29 Min. | | | | | | Kelly+D.H.Assy |
| | 9 | | @9.1' Dolomite-Brown-Mod Hard-Slightly Frac | | | | |
| | 39 Min. | | | | | | |
| 445.53' | 10 | | | | | | |

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|--|--|---|--|--|--|---|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 1 LOCATION 101-P7-West-Socket | | | | 11 Elevation of Bottom of Hole 430.1' | | | |
| 2 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 3 HOLE NO. | | | | 13 Casing Record | | Depth 97.5' Type 10" O.D. | |
| 4 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 5 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 6 Boring Method Reverse Rotary <input checked="" type="checkbox"/> | | | | 16 DATE HOLE STARTED 11/6/81 COMPLETED 11/10/81 | | | |
| 7 DEPTH DRILLED INTO ROCK 24.7' | | | | 17 ELEVATION TOP OF HOLE 553.03' T.O. Platform | | | |
| 8 TOTAL DEPTH OF HOLE 25.43' | | | | 18 TOTAL CORE RECOVERY FOR BORING 455.53' T.O. Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|---------------|--|----------------|----------------|-----------------|-------------------------------|
| 445.53' | 10 | | Con't. | | | | Con't. |
| | 32 Min. | | Dolomite-Brown-Mod. Hard- Slightly Frac. | | | | 4th-27 RPM w/H ₂ O |
| | | | @10.4'-Chert-Brown- Grey-Hard | | | | 146.9' Stem- |
| | | | @10.6'-Dolomite-Brown- Grey-Mod. Hard-Slightly Frac. | Milky Brown | | | Kelly+D.H. Ass |
| | 32 Min. | | @11.5'-11.6'-Chert-Dark Brown-Hard | | | | Lake El. 11/5/81 |
| | | | @11.6'-Dolomite-Grey- Mod. Hard | | | Smooth | 542.84' |
| | 31 Min. | | @12.4'-12.5'-Chert- Black-Hard | | | | |
| | | | @12.5'-Dolomite-Light Grey-Mod. Hard | | | | |
| | 18 Min. | | @13.6'-Dolomite-Buff & Dark Grey-Mod. Hard- | | | | |
| | | | Buff-Fe Stained | | | | |
| | 21 Min. | | @14.0'-Dolomite-Dark Grey- Mod. Hard | Milky Grey | | | |
| | | | @14.5'-15.0'-Shaley Dolomite- Black-Dark Grey-Soft- | | | | |
| | | | Mod. Hard | | | | |
| | 32 Min. | | @15.0'-Dolomite-Grey- Mod. Hard | | | | |
| | | | | | | | |
| | 37 Min. | | | | | | |
| | | | | | | | |
| | 34 Min. | | | | | | |
| | | | | | | | |
| | 32 Min. | | | | | | |
| | | | | | | | |
| | 28 Min. | | @19.2'-Dolomite-Dark Grey-Mod. Hard | | | | |
| 435.53' | 20 | | | | | | |

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|--|--|---|--|--|--|-------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 of 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION 101-P7-West-Socket | | | | 11 Elevation of Bottom of Hole 430.1' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO. | | | | 13 Casing Record Depth 97.5' | | Type 10.0' O.D. | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Reverse Rotary Box | | | | 16 DATE HOLE STARTED 11/6/81 COMPLETED 11/10/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 24.7' | | | | 17 ELEVATION TOP OF HOLE 553.03' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 25.43' | | | | 18 TOTAL CORE RECOVERY FOR BORING 455.53' T.O. Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|------------|--|------------|-------------|--------------|------------------------------|
| 435.53' | 20 | | Con't. | | | | Con't. |
| | 30 Min. | | Dolomite-Dark Grey-Mod. Hard | | | | 4th-27RPM w/H ₂ O |
| | 21 | | @20.2'-Dolomite-Grey-Mod. Hard | | | | 146.9' Stem- |
| | 30 Min. | | | | Milky Grey | | Kelly+D.H.Assy |
| 433.53' | 22 | | @22.2'-Dolomite-Grey-Dark Grey-Mod. Hard | | | | Stop-2:38@22.0' |
| | 29 Min. | | | | | | Add 20.2' Joint |
| | 23 | | | | | | 11/9/81 |
| | 27 Min. | | | | | | 11/10/81 |
| | 24 | | @24.4'-Dolomite-Buff-Dark Grey- Mod. Hard-Slightly Frac. | | | | Smooth Start 7:20 |
| 430.6' | 25 | | | | | | 4th-27RPM w/H ₂ O |
| 430.2' | 11 Min | | Bottom of Rock Socket | | | | 167.1' Stem |
| | | | | | | | Kelly+D.H.Assy |
| | | | | | | | Stop 8:51-B.O.H. |
| | | | | | | | plan B.O.H. El. 430.6' |

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|---|------------|----------------------------------|---|---|----------------|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 1 of 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 1 1/2" Split-Rock | | | |
| 2 LOCATION 101-28-West-Socket | | | | 11 Elevation of Bottom of Hole 434.3' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO 1 | | | | 13 Casing Record Depth 100' Type 10" O.D. | | | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BORES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 10/23/81 542.35' | | | |
| 7 Boring Method Reverse Rotary Wash | | | | 16 DATE NOLE 10/23/81 10/26/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 22.2' | | | | 17 ELEVATION TOP OF HOLE 557.93 T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 26.73' | | | | 18 TOTAL CORE RECOVERY FOR BORING 461.03 T.O. Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 456.5 T.O. Rock | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 461.03 | | | | | | | |
| | 3 Min. | | Sand | | | | 10/23/81 Start-12:11 1st-7rpm w/H2O Lake-EL-542.35 156.3' Stem- Kelly + D.H. Assy. Stop-1:13- Swivel Check Start-1:32 @5.4' 4th-27rpm Stop-5:15 @10.0' |
| | 5 Min. | | | | | | |
| | 34 Min. | | Cement Grout | | | | |
| | 28 Min. | | | | | | |
| 456.5 | 16 Min. | | Overburden Ave Top of Rock Chert- Grey -Hard | | | | |
| | 23 Min. | | 24.9' Dolomite-Light Grey- Mod Hard- Hard-Slightly Silic | | | | |
| | 23 Min. | | 25.6' Chert-Light Grey-Hard | | | | |
| | 26.0' | | Dolomite-Light Buff- Mod Hard- Hard-Slightly Silic | | | | |
| | 57 Min. | | 26.8' Sandy Dolomite-Light Buff Mod Hard | | | | |
| | 44 Min. | | 27.0' Dolomite-Light Grey- Mod Hard- Hard-Slightly Silic | | | | |
| | 34 Min. | | 27.6' Dolomite-Light Buff- Hard-Silic-Slightly Frac. | | | | |
| | 34 Min. | | 28.7' Dolomite-Buff Grey- Mod Hard- Slightly Frac. | | | | |
| 451.03 | 10 | | | | | | |

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|---|--|---|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 3 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | |
| LOCATION 101-P8-West-Socket | | 11 Elevation of Bottom of Hole 434.0' | | |
| Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | |
| HOLE NO | | 13 Casing Record | Depth 100' | Type 10" O.D. |
| NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water | | |
| Boring Method Reverse Rotary WPM | | 16 DATE HOLE STARTED 10/23/81 COMPLETED 10/26/81 | | |
| DEPTH DRILLED INTO ROCK 22.5' | | 17 ELEVATION TOP OF HOLE 557.93' T.O. Platform | | |
| TOTAL DEPTH OF HOLE 27.03' | | 18 TOTAL CORE RECOVERY FOR BORING 461.03' T.O. Grout | | |
| | | 19 SIGNATURE OF INSPECTOR 456.5' T.O. Rock | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|------------|------------|--|------------|-------------|--------------|---|
| 451.03' | 10 | | Con't. | | | | 10/24/81 |
| | 36 Min. | | Dolomite-Buff-Grey-Mod Hard-Slightly Frac. | | Milky Brown | | Start-7:44 @10.0' 4th-27rpm-w/H2O 156.3' Stem-Kelly + D.H. Assy. Lake EL-542.38 |
| | 11 34 Min. | | @10.8' Dolomite-Light-Dark Grey-Mod Hard-Hard-Dark Grey Silic-Slightly Frac. | | | | |
| | 12 36 Min. | | @11.5' Dolomite-Grey-Mod Hard-Slightly Frac. | | Milky Grey | | |
| | 13 38 Min. | | | | | Spaced | |
| | 14 40 Min. | | @14.6' Dolomite-Grey-Mod Hard-Slightly Frac w/FE Stained Frac Planes | | | | |
| | 15 30 Min. | | | | | | |
| | 16 37 Min. | | | | | | |
| | 17 28 Min. | | @17.5' Dolomite-Grey-Mod Hard-Hard Slightly Silic-Slightly Frac w/FE Stained Frac Planes | | | | |
| | 18 28 Min. | | @18.3'-18.5' Chert-Brown-Hard | | | | |
| | 19 31 Min. | | @18.5' Dolomite-Light Grey-Hard Highly Siliceous | | | | |
| | 20 441.03' | | @19.4 Dolomite-Light Grey-Mod Hard | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
|---|-------|----------------------------------|--|---|----------------|--------------------------|--|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| LOCATION 101-P8-West-Socket | | | | 11 Elevation of Bottom of Hole 434.0' | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| HOLE NO | | | | 13 Casing Record | | Depth 100' Type 10' O.D. | |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method Revers Rotary xxx | | | | 16 DATE HOLE | | 10/23/81 10/26/81 | |
| DEPTH DRILLED INTO ROCK 22.5' | | | | 17 ELEVATION TOP OF HOLE 557.93' T.O. Platform | | | |
| TOTAL DEPTH OF HOLE 27.03' | | | | 18 TOTAL CORE RECOVERY FOR BORING 461.03' T.O. Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 456.5' T.O. Rock | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS Con't. |
| 441.03' | 20 | | Dolomite-Light Grey- Mod Hard @20.3'-20.4' | | | | 10/24/81 4th-27rpm w/H2O |
| | 21 | Min. | Shale-Brown-Soft @20.4' | | | | 156.3' Stem- Kelly + D.H. Assy. |
| | 22 | Min. | Dolomite-Buff-Mod Hard @21.0' | | | | Lake EL-542.38 |
| | 23 | Min. | Dolomite-Grey-Mod Hard @21.9' | | | | |
| | 24 | Min. | Dolomite-Light Grey- Mod Hard-Friable @22.2' | | | | |
| | 25 | Min. | Dolomite-Dark Grey- Mod Hard-Massive | Milky Grey | | Smooth | |
| 437.03' | 26 | Min. | | | | | 10/24/81 10/26/81 Start-7:15 4th-27rpm w/H2O 156.3' Stem- Kelly + D.H. Assy. Stop-8:51-B.O. |
| 434.5' | 27 | Min. | Bottom of Rock Socket | | | | Plan B.O.H. 434.5' |

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|--|--------------|---|---|--|--------------------|---|---|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 of 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION 101-PB-East-Socket | | | | 11 Elevation of Bottom of Hole 433.9' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO. | | | | 13 Casing Record | | Depth 100' Type 10' O.D. | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 10/26-542.53' | | | |
| 7 Boring Method Reverse Rotary Box | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE 557.03' T.O. Platform | |
| 8 DEPTH DRILLED INTO ROCK 21.9' | | | | 18 TOTAL CORE RECOVERY FOR BORING 460.13' T.O. Grout | | 19 SIGNATURE OF INSPECTOR 455.8' T.O. Rock | |
| 9 TOTAL DEPTH OF HOLE 26.23' | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 460.13 | | | | | | | |
| | 3 Min | | Sand | | | | Start-3:15 1st-7RPM-w/H ₂ O 156.3' Stem-Kelly & D.H. Assy. Lake EL 10/26- 542.53' @2.5' 4th-2.7RPM Stop-4:18@5.0' |
| | 4 Min | | | | | | |
| | 36 Min | | Cement Grout | | | | |
| | 7 Min | | | | | | |
| | 13 Min | | Overburden | | | | |
| 455.8' | | | Ave Top of Rock | | | | |
| | 13 Min | | Chert-Grey-Hard | | | | |
| 455.13' | | | @5.0' | | | | |
| 454.73' | 1 hr | | Dolomite-Light Grey-Hard & Siliceous | | | | 10/28/81 Start-2:31 1st-7RPM w/H ₂ O 146.9' Stem-Kelly & D.H. Assy. Lake EL- @5.1' 2nd-17RPM Stop-3:15 @5.4' |
| | 25 min | | @5.4' Dolomite-Buff-Mod Hard | | | | |
| | 30 Min | | @5.8' Dolomite-Buff-Mod Hard | | | | |
| | 35 Min | | 6.0-6.2 Chert-Grey-Hard | | | | |
| | 35 Min | | 6.2 Dolomite v. Hd Tan-Num healed jts & frac Fe stained | | | | |
| | 40 Min | | | | | | |
| | 40 Min | | Dolomite Mod-Hard-SL Frac-Tan-Grey | | | | |
| 450.13' | 10 | | | | | | |

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|---|-----------|----------------------------------|--|---|----------------|--|---|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| 2 LOCATION 101-P8-East-Socket | | | | 11 Elevation of Bottom of Hole 434.0' | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 4 HOLE NO | | | | 13 Casing Record Depth 100' | | Type 10' O.D. | |
| 5 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water 542.46 | | | |
| 7 Boring Method Reverse Rotary MXX | | | | 16 DATE HOLE 10/26/81 | | 17 ELEVATION TOP OF HOLE 557.03' T.O. Platform | |
| 8 DEPTH DRILLED INTO ROCK 21.8' | | | | 18 TOTAL CORE RECOVERY FOR BORING 460.13' T.O. Grout | | | |
| 9 TOTAL DEPTH OF HOLE 26.13' | | | | 19 SIGNATURE OF INSPECTOR 455.8' T.O. Rock | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 450.13' | 10 | | Dolomite Hd Tan-Grey SL Frac | | | | 10/29/81 4th-27RPM w/H ₂ O 146.9' Stem-Kelly + D.H. Assy. |
| | 35 Min | | | | | | |
| | 11 | | @11.3' | | | | |
| | 39 Min | | Dolomite-Buff-Grey- Mod Hard-SL Frac. | | | | |
| | 12 | | @12.3' | | | | |
| | 31 Min | | Dolomite-Grey-Hard- Silic | | | | |
| | 13 | | @12.8' | | | | |
| | 34 Min | | Dolomite-Buff-Grey- Mod Hard | | | | |
| | 14 | | @13.6'-13.7' | | | | |
| | 31 Min | | Shale-Brown-Soft | | | | |
| | 15 | | @13.7' | | | | |
| | 30 Min | | Dolomite-Hard-Silic- Frac.w/FE Stained Frac Planes | | | | |
| | 16 | | @14.8' | | | | |
| | 38 Min | | Dolomite-Buff-Mod Hard- Grey | Light Brown | | Smooth | |
| | 17 | | @15.7' | | | | |
| | 37 Min | | Dolomite-Buff-Mod Hard- Frac.w/FE Stained Frac. Planes | | | | |
| | 18 | | @16.8' | | | | |
| | 50 Min | | Dolomite-Brown-Hard-Silic | | | | |
| 441.53 | 19 | | @17.0' | | | | 10/29/81 |
| | 34 Min | | Dolomite-Brown-Hard-Silic Frac.w/FE Stained Frac. Planes | | | | 10/30/81 |
| | 20 | | @17.1' | | | | Start |
| | | | Chert-Brown-Hard | | | | 4th-27RPM w/H ₂ O |
| | | | @17.9' | | | | 146.9' Stem-Kelly |
| | | | Dolomite-Hard-Silic- Frac.w/FE Stained Frac Planes | | | | +D.H. Assy. |
| 440.13' | | | @18.4 Dolomite-Light Grey-Mod Hard | | | | 166 |
| | | | @18.9 Dolomite-Buff- Grey-Mod Hard-SL Frac. | | | | |
| | | | @19.9' Dolomite Dark Grey-Mod Hard | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
|--|--------|---|--|--|-------------|---|--|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | | |
| LOCATION 101-P8-East-Socket | | | | 11 Elevation of Bottom of Hole 434.0' | | | |
| Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| HOLE NO. | | | | 13 Casing Record | | Depth 100' Type 10" O.D. | |
| NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method Revers Rotary XXX | | | | 16 DATE HOLE | | STARTED 10/26/81 COMPLETED 10/30/81 | |
| DEPTH DRILLED INTO ROCK 21.8' | | | | 17 ELEVATION TOP OF HOLE 557.03' T.O. Platform | | | |
| TOTAL DEPTH OF HOLE 26.13' | | | | 18 TOTAL CORE RECOVERY FOR BORING 460.13' T.O. Grout | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 455.8' T.O. Rock | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| | 20 | | Con't. | | | | 10/30 Con't. |
| | 28 Min | | Dolomite-Dark Grey-Mod Hard | | | | 4th-27RPM w/H ₂ O 146.9' Stem-Kelly + D.H. Assy. Stop-11:02-B.O.H. |
| | 21 | | @21.2' | | | | |
| | 29 Min | | Dolomite-Light Grey-Mod Hard | | | Smooth | |
| | 22 | | @22.1' | | | | |
| | 31 Min | | Dolomite-Light Grey-Mod Hard | | | | |
| | 23 | | | | Milky Grey | | |
| | 28 Min | | | | | | |
| | 24 | | | | | | |
| | 29 Min | | | | | | |
| | 25 | | @25.0' | | | | |
| 434.5' | 24 Min | | Dolomite-Grey-Mod Hard-Hard-Slightly Silic | | | | Plan B.O.H. 434.5' |
| | | | @25.4' | | | | |
| 433.9 | 26 | 6 Min | Dolomite-Dark Grey-Mod Hard Bottom of Rock Socket | | | | |

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|---|--|--|--|-------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | Sheet 1 of 5 sheets |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith Rock | | |
| LOCATION 101-P9-West-Socket | | 11 Elevation of Bottom of Hole 435.2' | | |
| Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | |
| HOLE NO. | | 13 Casing Record Depth 75' Type 10" O.D. | | |
| NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water 543.59' 12-04-82 | | |
| Boring Method Reverse Rotary XXX | | 16 DATE HOLE 12-4-81 12-8-81 | | |
| DEPTH DRILLED INTO ROCK 41.7' | | 17 ELEVATION TOP OF HOLE 556.03' T.O. Platform | | |
| TOTAL DEPTH OF HOLE 44.33' | | 18 TOTAL CORE RECOVERY FOR BORING 479.53' T.O. Grout | | |
| | | 19 SIGNATURE OF INSPECTOR 476.9' T.O. Rock | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------------|------------|--|------------|-------------|--------------|---|
| 479.53' | | | | | | | 12-4-81 |
| | 11 Min. | | Overburden (Red Clay) | | | | Start 10:00 1st-7RPM w/H ₂ O 146.9' Stem-Kelly + D.H. Assy. Lake El.-543.59' |
| | 12 Min. | | | | Red | Smooth | @2.7' 2nd-17RPM @2.9' 4th-27RPM Stop 12:29 - Tighten Kelly Bolts Start 12:36 Stop 3:15 @ 7.0' |
| 476.9 | 38 Min. | | Ave top of rock Dolomite-grey-mod.hard | | | | |
| | 44 Min. | | @3.5'-Chert-milky white-hard @3.9'-Dolomite-grey-mod.hard | | | | |
| | 1 hr. 5 Min. | | @4.6'-Dolomite-brown-grey-Mod.hard @4.9'-Dolomite-brown-Mod.hard-Hard-Slightly silic. | | | | |
| | 1 hr. 18 Min. | | @5.9'-Dolomite-grey-Mod.hard-Hard-Slightly silic. | | Milky Brown | | |
| | 1 hr. | | @6.7'-6.8'-Shale-black-soft-pyritic @6.8'-Dolomite-light brown-grey-mod.hard | | | | |
| 472.53 | 1 hr. 3 Min. | | @7.5'-Dolomite-Grey-mod.hard | | | | 12-4-81 12-5-81 Start 7:35 4th-27RPM-w/H ₂ O 146.9' Stem-Kelly +D.H.Assy. Stop-9:15-Weld Kelly joint Start-10:18 |
| | 54 Min. | | | | Milky Grey | | |
| | 25 Min. | | @9.0'-Dolomite-light grey-mod.hard-friable | | | | |
| 469.53 | | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 2 of 5 Sheets | |
|--|---------|----------------------------------|--|---|----------------|---------------------------|---|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 101-P9-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BORERS | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Rotary dry | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 469.53' | 10 | | Con't. | | | | Con't. 12-5-81 |
| | 38 Min. | | Dolomite-light grey-mod.hard friable | | | | 4th-27RPM-w/H ₂ O |
| | 11 | | | | | | 146.9' Stem-Kelly |
| | 35 Min. | | | | Milky Grey | | +D.H.Assy. |
| | 12 | | | | | Smooth | Lake El.-543.64' |
| | 30 Min. | | | | | | |
| | 13 | | @13.1'-13.2'-Shale-black-soft | | | | |
| | 42 Min. | | @13.2'-Dolomite-dark grey-mod. hard | | | | |
| | 14 | | | | | | |
| | 24 Min. | | @14.5'-14.6'-Shale-black-soft | | | | |
| | 15 | | @14.6'-Dolomite-dark grey-mod.hard | | | | |
| | 27 Min. | | | | | | |
| | 16 | | | | | | |
| | 24 Min. | | @16.5'-Dolomite-brown-mod. hard-slightly-frac. | | | | |
| | 17 | | @16.7'-Shale-black-soft | | | | |
| | 35 Min. | | @16.8'-Dolomite-brown-mod. hard | | | | |
| | 18 | | @17.5'-Dolomite-hard-brown-silic-slightly frac. | | Milky Brown | | |
| 461.53' | 34 Min. | | @18.1'-Dolomite-grey-mod.hard-hard-slightly silic | | | | 12-5-81 |
| | 19 | | @19.1'-Dolomite-grey-hard-silic | | | | 12-7-81 |
| | 47 Min. | | @19.6'-22.7'-Cavern-clay filled-red (est. 1/8 of hole) | | | | Start 7:15 |
| 459.53' | 20 | | | | Red | Rough | 146.9' Stem-Kelly + D.H.Assy. |
| | | | | | | | 4th-27RPM-w/H ₂ O |
| | | | | | | | @8:10-19.6' 1st 7RPM-w/H ₂ O |

| | | | | |
|--|--|---|--|-------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 5 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION 101-P9-West-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| HOLE NO. | | 13 Casing Record Depth Type | | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15 ELEVATION of Water | | |
| Boring Method Rotary dry | | 16 DATE HOLE STARTED COMPLETED | | |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|------------|---|------------|-------------|--------------|-------------------------------|
| 459.53' | 20 | Con't. | | | | | Con't. |
| | 30 Min. | | Cavern-clay filled-red (Est. 1/8 of hole) | | | | 1st-7RPM w/H ₂ O |
| | | | Bal.-Dolomite-grey-hard silic | | | | 146.9' Stem Kelly + D.H.Assy. |
| | 21 | | | | Red | Rough | @23'-4th-27RPM |
| | 39 Min. | | | | | | |
| | 22 | | | | | | |
| | 23 | | @22.7'-Cavern Ends | | | | |
| | | | @22.7'-Dolomite-grey-mod.hard | | | | |
| | 35 Min. | | | | | | |
| | 24 | | @23.5'-Dolomite-light brown-mod.hard | | Milky Brown | Smooth | |
| | 49 Min. | | | | | | |
| | 25 | | @24.6'-Dolomite-light brown-mod.hard-hard-slightly silic | | | | |
| | 34 Min. | | | | | | |
| | 26 | | | | | | |
| | 36 Min. | | @26.6'-Dolomite-grey-hard-silic | | | | |
| | 27 | | | | | | |
| | 50 Min. | | @27.4'-Dolomite-grey-light brown-mod.hard-hard-slightly silic | | | | |
| | 28 | | | | | | |
| | 39 Min. | | @28.7'-Dolomite-dark grey & light brown-mod.hard | | | | |
| | 29 | | | | | | |
| | 41 Min. | | @29.5'-Dolomite-dark grey-mod.hard | | Milky Grey | | |
| 449.53' | 30 | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 4 OF 5 SHEETS | |
|--|---------------|----------------------------------|--|---|-------------|------------------------|---|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION 101-P9-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO | | | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method Rotary sty | | | | 16 DATE MOLE | | 17 STARTED COMPLETED | |
| DEPTH DRILLED INTO ROCK | | | | 18 ELEVATION TOP OF HOLE | | | |
| TOTAL DEPTH OF HOLE | | | | 19 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 20 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 449.53' | 30 | | Con't. | | | | Con't. |
| | 38 Min. | | Dolomite-Dark grey-mod.hard @30.1'-30.15'-Shale-black-soft @30.15'-Dolomite-dark grey-mod.hard | | | | 4th-27RPM w/H ₂ O 146.9' Stem Kelly + D.H.Assy. Lake El.-543.71' 12-7-81 |
| | 47 Min. | | @31.8'-Dolomite-grey-hard-silic | | | | |
| 447.03' | 45 Min. | | @32.4'-Dolomite-grey-mod.hard | | | | 12-7-81 12-8-81 Start 7:25 4th-27RPM w/H ₂ O 146.9' Stem Kelly + D.H.Assy. Lake El.-543.73 |
| | 1 hr. 14 Min. | | @33.0'-Dolomite-light brown-light grey-mod.hard | | Milky Grey | Smooth | |
| | 52 Min. | | | | | | |
| | 48 Min. | | @35.6'-Dolomite-grey-mod.hard | | | | |
| | 35 Min. | | @36.5'-Dolomite-light brown-hard-silic | | | | |
| | 30 Min. | | @37.7'-37.8'-Chert-milky white-hard | | | | |
| | 46 Min. | | @37.8'-Dolomite-grey-mod.hard-weathered @38.4'-Dolomite-dark grey-mod.hard-hard-slightly silic @38.9'-Chert-milky white-hard | | | | |
| | 33 Min. | | @39.0'-Dolomite-light grey-hard-silic | | | | |
| 439.53' | 40 | | | | | | |

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|--|------------|----------------------------------|---|---|----------------|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 5 OF 5 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION 101-P9-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Rotary ary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 439.53' | 40 | | Con't. | | | | Con't. |
| | 35 Min. | | Dolomite-light grey-hard-silic @40.1'-40.2'-Chert-milky white- grey-hard | | | | 4th-27RPM w/H ₂ O 146.9' Stem Kelly + D.H.Assy. Lake El.-543.73' Stop-2:54-B.O.H. |
| | 41 | 20 Min. | @40.2'-Dolomite-light grey- very hard-highly siliceous @40.9'-Dolomite-buff-mod. hard-frac w/fe stained frac planes | | Milky Grey | Smooth | |
| | 42 | 25 Min. | | | | | |
| | 43 | 22 Min. | | | | | |
| 435.5' | 44 | 12 Min. | Bottom of rock socket | | | | Plan B.O.H. |
| 435.2' | | | | | | | |

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|--|--|--|--|-------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 5 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith-Rock | | |
| LOCATION 101-P9-East-Socket | | 11 Elevation of Bottom of Hole 435.3' | | |
| Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | |
| HOLE NO | | 13 Casing Record Depth 75' Type 10' O.D. | | |
| NAME OF DRILLER Don Uchtman | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 15 ELEVATION of Water 11-24 - 543.23' | | |
| Boring Method Reverse Rotary XXX | | 16 DATE HOLE STARTED 11-24-81 COMPLETED 12-2-81 | | |
| DEPTH DRILLED INTO ROCK 42.00' | | 17 ELEVATION TOP OF HOLE 556.33' T.O. Platform | | |
| TOTAL DEPTH OF HOLE 44.53' | | 18 TOTAL CORE RECOVERY FOR BORING 479.83' T.O. GROUT | | |
| | | 19 SIGNATURE OF INSPECTOR 477.3' T.O. Rock | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------------|------------|--|------------|-------------|--------------|--|
| 479.83' | | | | | | | |
| | 9 Min. | | Overburden (Clay) | | Red | | Start 7:49 1st-7RPM w/H 146.9' Stem Kelly + D.H. Assy. |
| | 7 Min. | | | | | Smooth | @2.6' 2nd-17RPM @3.4' 4th-27RPM Stop 3:17 |
| 477.3' | 1 hr. 7 Min. | | Ave top of rock | | | | |
| | | | Quartzite-Milky white-hard-very hard | | | | |
| | | | @2.8'-Dolomite-buff-mod.hard | | | | |
| | 1 hr. 2 Min. | | @3.7'-Dolomite-light grey-mod.hard | | | | |
| | | | | | Milky Brown | | |
| | 41 Min. | | @4.6'-Dolomite-dark grey & brown-mod.hard | | | | |
| | | | @5.2'-Dolomite-brown-mod. hard-hard-slightly silic | | | | |
| | 1 hr. 19 Min. | | | | | | |
| | | | @6.7'-Chert-brown-hard | | | | |
| | 1 hr. 16 Min. | | @6.8'-Dolomite-light brown-mod.hard | | | | |
| | | | @7.1'-7.3'-Chert-milky white-light grey-hard | | | | |
| | 1 hr. 5 Min. | | @7.3'-Dolomite-brown-mod.hard | | | | |
| | | | @7.9'-Dolomite-buff-mod.hard | | | | |
| | | | | | | | |
| | 34 Min. | | @8.5'-Dolomite-grey-mod. hard | | | | |
| 470.73' | | | | | Milky Grey | | 11-23-81 11-24-81 |
| | 44 Min. | | | | | | Start 7:42 4th-27RPM-w/H ₂₀ 146.9' Stem Kelly + D.H. Assy. |
| 469.83' | | | | | | | Lake El. - 543.25' |

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|--|--|---|--|--------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | Sheet: 2 OF 5 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | |
| 1 LOCATION 101-P9-East Socket | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | |
| 2 Geotechnician | | 13 Casing Record Depth Type | | |
| 4 HOLE NO | | 14 TOTAL NUMBER CORE BOXES | | |
| 5 NAME OF DRILLER | | 15 ELEVATION of Water | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 16 DATE HOLE STARTED COMPLETED | | |
| 7 Boring Method Rotary ary | | 17 ELEVATION TOP OF HOLE | | |
| 8 DEPTH DRILLED INTO ROCK | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| 9 TOTAL DEPTH OF HOLE | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|---------|------------|--|------------|-------------|--------------|--|
| 469.83' | 10 | | Con't. | | | | 11-25 Con't. |
| | 36 Min. | | Dolomite-Grey-Mod. Hard | | | | 4th-27REM-w/H ₂ O 146.9' Stem-Kelly D.H. Assy. Lake E1-543.25' |
| | 11 | | | | | | |
| | 32 Min. | | | | | | |
| | 12 | | | | Milky Grey | | |
| | 34 Min. | | | | | Smooth | |
| | 13 | | @13.1'-13.2' Shale-Black-Soft | | | | |
| | 32 Min. | | @13.2' Dolomite-Grey-Mod. Hard | | | | |
| | 14 | | | | | | |
| | 27 Min. | | @14.6'-Shale-Black-Soft @14.7' - Dolomite-Grey-Mod. Hard | | | | |
| | 15 | | @15.3' - Dolomite-Buff-Mod. Hard | | | | |
| | 23 Min. | | | | | | |
| | 16 | | | | Milky Brown | | |
| | 25 Min. | | | | | | |
| | 17 | | | | | | |
| | 20 Min. | | @17.4'-Shale-Brown-Soft @17.5'-Dolomite-Buff-Mod. Hard - Slightly Frac w/Fe stained Fracs | | | | |
| | 18 | | @17.8'-Sandy Dolomite-Buff-Mod. Hard FRIABLE | | | | |
| | 28 Min. | | | | | | |
| | 19 | | @19.0'-Dolomite-Light Grey-Mod. Hard-Hard-Slightly Silic | | | | |
| | 38 Min. | | | | Milky Grey | | |
| 459.83' | 20 | | | | | | |

| | | | | | | | |
|---|--|----------------------------------|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 5 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT | | | |
| 2. LOCATION 101-P9-East-Socket | | | | 11. Elevation of Bottom of Hole | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4. HOLE NO. | | | | 13. Casing Record | | Depth Type | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15. ELEVATION of Water | | | |
| 7. Boring Method Rotary sty | | | | 16. DATE HOLE | | STARTED COMPLETED | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|--------------|---|------------|-------------|--------------|--|
| 459.83' | 20 | | Con't. | | | | 11-25 Con't. |
| | 26 | Min. | Dolomite-Light Grey-Mod.Hard-Hard-Slightly Silic | | | | 4th-27RPM w/H 20 |
| | 21 | 37 Min. | @20.4'-Dolomite-Light Grey-Mod. Hard | | | | 146.9' Stem-Kelly & D.H.Assy. Lake El - 543.25' |
| | 22 | 44 Min. | | | Milky Grey | | 11-25-81 |
| 457.63' | 23 | 1 hr. 2 Min. | @23.1'-Dolomite-Brown-Grey-Hard Silic | | | | 12-1-81 |
| | 24 | 53 Min. | @23.8'-Dolomite-Grey-Mod.Hard | | | | Start 7:30 |
| | 25 | 58 Min. | @24.4'-Dolomite-Buff-Mod.Hard | | | | 4th-27 RPM w/H20 |
| | 26 | 1 hr. 2 Min. | @26.5'-Dolomite-Brown-Mod. Hard-Hard-Slightly Silic | | | | 146.9' Stem-Kelly & D.H. Assy. Lake El - 543.50' |
| | 27 | 1 hr. 3 Min. | | | Milky Brown | | |
| | 28 | 1 hr. 2 Min. | @28.5'-Dolomite-Light Brown-Mod. Hard | | | | |
| | 29 | 55 Min. | | | | | |
| 449.83' | 30 | | | | | | |

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|---|--|--|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Maseman Construction Co. | Sheet 4 of 5 Sheets |
| Norfolk Lake Bridges | | Elevation of Bottom of Hole | | |
| 101-P9-East-Socket | | 12 HANDMADE DEPTH CORRECTIONS OF TOTAL | | |
| Geotechnician | | 13 Casing Record Depth Type | | |
| HOLE NO | | 14 TOTAL NUMBER CORE BOXES | | |
| NAME OF DRILLER | | 15 ELEVATION OF WATER | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 16 DATE HOLE STARTED COMPLETED | | |
| Boring Method Rotary ANY | | 17 ELEVATION TOP OF HOLE | | |
| DEPTH DRILLED INTO ROCK | | 18 TOTAL CORE RECOVERY PER BORING | | |
| TOTAL DEPTH OF HOLE | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|------------|---------------|--|---------------|----------------|-----------------|---|
| 449.83' | 30 | Con't. | | | | | 12-1-81 Con't. |
| 449.53' | | | Dolomite-Light Brown-Mod.Hard | | | | 4th-27RPM w/H2O |
| | 59 Min. | | | | Milky Brown | | 146.9' Stem-Kelly & D.H. Assy. Stop 3:17 |
| | 31 | | @30.7'-Dolomite-Light Brown- Grey-Mod.Hard-Slightly Frac | | | | 12-2-81 |
| | 54 Min. | | | | | | Start 7:16 @30.3' |
| | 32 | | | | | | 4th-27RPM w/H2O |
| | 38 Min. | | @32.6'-Dolomite-Grey-Mod.Hard | | | | Smooth 146.9' Stem-Kelly & D.H. Assy. Lake El - 543.54' |
| | 33 | | @33.1'-Dolomite-Buff-Grey- Mod.Hard-Friable | | Milky Grey | | |
| | 19 Min. | | @33.8'-Dolomite-Buff-Mod.Hard | | | | |
| | 34 | | | | Milky Brown | | |
| | 13 Min. | | | | | | |
| | 35 | | @35.0'-Dolomite-Grey-Pink- Hard Silic | | | | |
| | 23 Min. | | @35.6'-Dolomite-Buff-Mod.Hard | | | | |
| | 36 | | @36.3'-36.4'-Chert-Grey- Brown-Hard | | | | |
| | 43 Min. | | @36.4'-Dolomite-Buff-Mod.Hard | | | | |
| | 37 | | @37.2'-Dolomite-Grey-Mod.Hard | | | | |
| | 20 Min. | | | | | | |
| | 38 | | @37.9'-Dolomite-Grey-Mod.Hard- Vuggy w/Quartz+Chert filled Vugs. | | | | |
| | 31 Min. | | @38.4'-Dolomite-Brown-Grey- Mod.Hard | | | | |
| | 39 | | @38.8'-Chert-Grey-Hard | | | | |
| | 29 Min. | | @38.9'-Dolomite-Light Brown- Grey-Mod.Hard-Hard-Slightly Silic | | | | |
| | | | @39.5'-Dolomite-Buff-Hard- Silic | | | | |
| 439.83' | 40 | | | | | | |

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|---|--|--|---|------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 5 OF 5 SHEETS |
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | |
| LOCATION 101-P9-East-Socket | | 11 Elevation of Bottom of Hole | | |
| Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF BIT | | |
| HOLE NO. | | 13 Casing Record Depth Type | | |
| NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | 15 ELEVATION OF WATER | | |
| Boring Method Rotary sty | | 16 DATE HOLE STARTED COMPLETED | | |
| DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19 SIGNATURE OF INSPECTOR | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|-------|------------|--|------------|-------------|--------------|-------------------------|
| 439.83' | 40 | | Con't. | | | | 12-2 Con't. |
| | | 52 Min. | Dolomite-Buff-Hard-Silic | | | | 4th-27RPM w/H |
| | | | @40.3'-40.5'-Chert-Grey-Hard | | | | 146.9' Stem- 20 |
| | | | @40.5'-Dolomite-Buff-Mod.Hard | | | | Kelly & D.H.Assy |
| | | | @40.9'-Chert-Grey-Hard | | | | Lake El-543.54' |
| 41 | | 30 Min. | @41.0'-Dolomite-Buff-Mod.Hard-Hard-Slightly Silic | | Milky Brown | Smooth | @2:35 1st-7RPM (Cavity) |
| | | | | | | | @2:45 4th-27RPM |
| | | | | | | | Stop-3:11-B.O.H. |
| | | 25 Min. | @42.5'-Chert-Light Brown-Hard | | | | |
| | | | @42.7'-Dolomite-Light Brown-Hard Silic | | | | |
| 43 | | 35 Min. | @43.4'-Dolomite-Buff-Mod. Hard-Frac w/Fe stained frac planes | | | Rough | |
| | | | @43.5'-Cavity (est.<1/8 of hole)in above Dol. | | | Smooth | |
| 435.5 | | 21 Min. | Bottom of Rock Socket | | | | Plan B.O.H. |
| 435.3 | | | | | | | |

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|---|-------------|----------------------------------|--|---|-------------|------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT 102 Smith-Rock | | | |
| LOCATION H101-P10-West-Socket | | | | 11 Elevation of Bottom of Hole 462.4' | | | |
| 1 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | | |
| 2 HOLE NO 1 | | | | 13 Casing Record Depth 62.5 Type 10 OD | | | |
| 3 NAME OF DRILLER Don Uchtman | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 4 DIRECTION OF HOLE 25 VERTICAL 0 INCLINED 0 DEG FROM VERT | | | | 15 ELEVATION of Water 9/28/81 542.44' | | | |
| 5 Boring Method Revers Rotary | | | | 16 DATE HOLE STARTED 9/29/81 COMPLETED 10/1/81 | | | |
| 6 DEPTH DRILLED INTO ROCK 26.67 | | | | 17 ELEVATION TOP OF HOLE 552.97 TOP | | | |
| 7 TOTAL DEPTH OF HOLE 26.67 | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR 489.07 TOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 489.07 | | | | | | | |
| | 36 min | | Chert - Grey - Brown Hard | | | | Start 10:39 |
| | | | .9 | | | | 1st 7rpm w/H2O |
| 1 | | | Dolomite - Pink - Grey Hard - Very Hard - Highly Siliceous | clay Red | Mod Smooth | | 117.1' stem kelly & D&H H2O level 9/29/81 |
| | 31 min | | 1.4 | | | | 542.34' 2nd 17rpm @LO' |
| 2 | | | Chert - Milky White - Hard | | | | @2:00 - 4.6' |
| | | | 1.8 | | | | 4th 27rpm Stop 5:15 @8.2' |
| | 39 min | | Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac with Iron stained Fractured planes | Milky Brown | Smooth | | |
| 3 | | | 2.5 | | | | |
| | 41 min | | Chert - Brown - Hard | | | | |
| | | | 2.8 | | | | |
| 4 | | | Dolomite - Grey - Brown Mod Hard | | | | |
| | 1 hr 18 min | | 3.4 | | | | |
| | | | Dolomite - Grey - Hard Silic - Slightly Frac with Fe stained frac planes | | | | |
| 5 | | | 3.6 | | | | |
| | 52 min | | Dolomite - Grey - Mod Hard - Frac with Fe stained frac planes | | | | |
| 6 | | | 4.2 | | | | |
| | | | Dolomite - Grey - Hard Very Hard - Highly Siliceous | | | | |
| | 42 min | | 5.4 | | | | |
| 7 | | | Dolomite - Buff - Mod Hard | | | | |
| | 1 hr 7 min | | 5.5-5.55 Shale-Black-Soft Dolomite - Buff - Mod Hard | | | | |
| | | | 6.2 | | | | 9/29/81 |
| 8 | | | Dolomite - Buff - Grey Mod Hard | | | | 9/30/81 |
| | 50 min | | 7.1 Dolomite - Brown Grey - Hard - Silic | | | | Start 7:22 Lake Elev. 542.25' |
| 9 | | | 7.8-8.0 Chert Pod - Brown Hard (EST 1/2 hole) | | | | 4th 27rpm w/H2O 117.1' stem kelly & D&H Assembly |
| | 55 min | | 8.0 Dolomite - Grey Hard Very Hard - Highly Siliceous | | | | |
| | | | 8.4 Dolomite - Grey - Mod Hard | | | | |
| 470.07 | 10 | | | | | | 178 |

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|--|--|---|--|---|--|-------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT Elevation of Bottom of Hole | | | |
| 2 LOCATION H101-Pl0-West-Socket | | | | 11 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 3 Geotechnician | | | | 12 Casing Record Depth Type | | | |
| 4 HOLE NO | | | | 13 TOTAL NUMBER CORE BOXES | | | |
| 5 NAME OF DRILLER | | | | 14 ELEVATION OF WATER | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG FROM VERT | | | | 15 DATE HOLE STARTED COMPLETED | | | |
| 7 Boring Method Rotary etc | | | | 16 ELEVATION TOP OF HOLE | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 SIGNATURE OF INSPECTOR | | | |

| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
|-----------|--------|------------|--|------------|-------------|--------------|---|
| 479.07 | 10 | | | | | | |
| | 36 min | | 9.1 Dolomite - Light Grey Mod Hard - Hard - Slightly Silic | | | | 4th 27rpm w/H2 117.1' stem - Kelly & DH A |
| | 11 | | 9.6 Dolomite - Light Grey Mod Hard | | Milky Brown | Smooth | |
| | 26 min | | Dolomite - Light Grey Mod Hard | | | | |
| | 12 | | 10.3 Dolomite - Buff - Grey Mod Hard | | | | |
| | 27 min | | 11.1 Dolomite - Buff - Mod Hard | | | | |
| | 13 | | 12.6 Dolomite - Buff - Mod Hard Frac with Fe stained frac planes | | | | |
| | 12 min | | 13.4 Dolomite - Buff - Grey Mod Hard - Extremely Frac | | | | |
| | 17 min | | | | | | |
| | 15 | | 15.0 Dolomite - Grey - Mod Hard - Slightly Frac | | | | |
| | 46 min | | 15.9 Dolomite - Grey - Mod Hard - Hard - Slightly Silic - Slightly Frac | | | | |
| | 16 | | | | | | |
| | 39 min | | | | | | |
| | 17 | | 17.2 Dolomite - Grey - Hard Very Hard - Highly Siliceous - Slightly Frac | | | | |
| | 48 min | | 17.8 - 17.85 Shale - Black - Soft | | | | |
| | 18 | | 17.85 Dolomite - Hard - Very Hard - Highly Siliceous Slightly Frac. | | | | |
| | 53 min | | 18.6 Dolomite - Brown - Hard Silic - Slightly Frac | | | | |
| | 19 | | 19.5 Dolomite - Grey - Hard - Very Hard - Highly Siliceous | | | | |
| 469.07 | 20 | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 3 OF 3 SHEETS | |
|--|--------|----------------------------------|--|---|-------------|------------------------|-----------------|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P10-West-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Rotary art | | | | 16 DATE HOLE STARTED COMPLETED | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 469.07 | 20 | | Dolomite - Grey - Hard | | | | 4th 27rpm w/H2O |
| | 42 min | | Very Hard - Highly Siliceous | | | | 117.1' stem - |
| | 21 | | 20.4 - 20.6 | | | | kelly & DHA |
| | 37 min | | Chert - Grey + Brown | | | | Lake Elev. |
| | 22 | | Hard | | | | 9/30/81 |
| | 50 min | | 20.6 | | | | 542.25' |
| | 23 | | Dolomite - Grey - Hard | | | | Stop 5:15 |
| | 42 min | | Silic - Fractured | | | | @23.2' |
| | 24 | | 22.5 | | | | |
| | 50 min | | Dolomite - Light Grey | | | | |
| | 25 | | Mod Hard | | | | |
| | 42 min | | 22.9 | | | | |
| | 26 | | Dolomite - Buff - Light | | | | |
| | 39 min | | Grey - Mod Hard | | | | |
| | 27 | | 23.4 | | | | |
| | 41 min | | Dolomite - Buff - Mod Hard | | | | |
| | 28 | | Slightly Fractured | | | | |
| | 35 min | | 25.2 | | | | |
| | 29 | | Dolomite - Buff - Mod | | | | |
| | 31 | | Hard | | | | |
| | 33 | | 26.5 | | | | |
| | 35 min | | Dolomite - Buff - | | | | |
| | 37 | | Grey = Mod Hard - | | | | |
| | 39 | | Slightly Frac | | | | |
| | 41 | | Bottom of Rock Socket | | | | |
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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | | SHEET 1 OF 3 SHEETS | | |
|---|--------|---|--|---|------------------------|-----------------|--------------------|
| PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT 102" Smith Rock | | 11 Elevation of Bottom of Hole 462.8' | | | |
| 2 LOCATION H101-P10-East-Socket | | 12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains | | 13 Casing Record Depth 62.7 Type 10 OD | | | |
| 3 Geotechnician Robert Schmoker | | 14 TOTAL NUMBER CORE BOXES | | 15 ELEVATION of Water 543.09 | | | |
| 4 HOLE NO | | 16 DATE HOLE 9/21/81 | | 17 ELEVATION TOP OF HOLE 553.22 TOP | | | |
| 5 NAME OF DRILLER Don Uchtman | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR 489.22 TOR | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 16 DATE HOLE 9/21/81 | | 17 ELEVATION TOP OF HOLE 553.22 TOP | | | |
| 7 Boring Method Reverse Rotary | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR 489.22 TOR | | | |
| 8 DEPTH DRILLED INTO ROCK 26.42 | | 19 SIGNATURE OF INSPECTOR 489.22 TOR | | | | | |
| 9 TOTAL DEPTH OF HOLE 26.42 | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 489.22 | | | | | | | |
| | 46 min | | Chert - Grey - Hard | | | | Start 12:48 |
| | | | Dolomite - Grey - Hard | | | | Lake Elev. 543.09' |
| | | | Silic | | | | 1st 7rpm w/H2O |
| | 1 hr | | Chert - Light Brown - Hard | | Milky | Smooth | 116.9' stem - |
| | 50 min | | Dolomite - Grey - Mod Hard | | | | kelly - DH A |
| | | | | | | | @1.0' 2nd 17rpm |
| | 2 hr | | Dolomite - Grey - Hard | | | | @1.1' 4th 27rpm |
| | | | Silic | | | | Stop 3:05 Back |
| | | | | | | | Flush Return |
| | 1 hr | | Dolomite - Grey - Mod | | | | Line Start 4:18 |
| 486.72 | 27 min | | Hard - Hard - Slightly | Silic | | | 9/21/81 |
| | | | | | | | 9/22/81 |
| | | | | | | | Lake Elev. 543.02' |
| | | | | | | | Start 7:33 |
| | 57 min | | Dolomite - Grey - Mod | | | | 4th 27rpm |
| | | | Hard | | | | w/H2O 116.9' |
| | | | | | | | stem - kelly |
| | 4 hr | | Dolomite - Grey - Mod Hard | | | | DH Assembly |
| | | | Hard - Hard Silic & Slightly | | | | Stop 5:15 |
| | 1 hr | | Fractured. | | | | @10.0' |
| | 3 min | | | | | | |
| | | | 5.0-5.1 | | | | |
| | 5 hr | | Shale - Black - Soft | | | | |
| | 8 min | | Dolomite - Grey - Mod Hard | | | | |
| | | | 5.9 | | | | |
| | 6 hr | | Dolomite - Dark Grey - Hard | | | | |
| | | | Silic | | | | |
| | 1 hr | | 6.5 | | | | |
| | 13 min | | Dolomite - Grey - Mod Hard | | | | |
| | | | Hard - Slightly Silic | | | | |
| | 7 hr | | 7.1 | | | | |
| | 1 hr | | Dolomite - Brown - Grey | | | | |
| | 15 min | | Mod Hard - Hard Slightly | | | | |
| | | | Silic | | | | |
| | 8 hr | | 7.5 | | | | |
| | | | Dolomite - Brown - Hard | | Milky | | |
| | 1 hr | | Silic | | Brown | | |
| | 32 min | | 8.8 | | | | |
| | | | Dolomite - Grey - Hard | | | | |
| | | | Very Hard - Highly Siliceous | | | | |
| | 9 hr | | 9.5 | | | | |
| | | | Dolomite - Grey - Mod | | | | |
| | 1 hr | | Hard - Hard - Slightly | | | | |
| | 52 min | | Silic | | | | |
| 479.22 | 10 | | | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | SHEET 2 OF 3 SHEETS | |
|--|-------|----------------------------------|--|---|-------------|------------------------|----------------|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| LOCATION H101-P10-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| HOLE NO. | | | | 13 Casing Record | | Depth Type | |
| NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 ELEVATION of Water | | | |
| Boring Method Rotary ary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 SIGNATURE OF INSPECTOR | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 479.22' | | | | | | | |
| | 1 hr | | Dolomite - Grey - Mod | | | | 9/23/81 |
| | 45min | | Hard - Hard - Slightly Silic | | | | Start 7:20 |
| | | | 10.2 | | | | @10.0' 4th |
| 11 | | | Dolomite - Grey - Hard | | Milky | | 27rpm w/H2O |
| | | | Silic | | Brown | | 116.9' stem |
| | | | 10.8 | | | Smooth | Kelly - DH A |
| | 1 hr | | Dolomite - Grey - Mod | | | | Lake Elev. |
| | 10min | | Hard - Hard - Slightly | | | | 542.90' |
| | | | Silic | | | | @14.6 1st 7rpm |
| 12 | | | 11.9 | | | | H2O off @15.4 |
| | | | Dolomite - Light Brown | | | | 4th 27rpm |
| | 1 hr | | Hard - Silic | | | | w/H2O Stop |
| | 35min | | 12.5 | | | | 5:15 @18.2 |
| | | | Dolomite - Blue Grey | | | | |
| 13 | | | Mod Hard - Hard - Hard | | | | |
| | | | Silic | | | | |
| | 1 hr | | 13.4 | | | | |
| | 8min | | Dolomite - Grey - Light | | | | |
| | | | Brown - Mod Hard - Hard | | | | |
| 14 | | | Brown Slightly Silic | | | | |
| | | | 14.2 | | | | |
| | 44 | | Dolomite - Light Grey | | | | |
| | min | | Mod Hard - Hard - Hard | | | | |
| | | | Slightly Silic | | | | |
| 15 | | | 14.6 - 15.4 | | Yellow | | |
| | | | Siltstone Pod - Yellow | | | Rough | |
| | 46 | | Soft (est 1/4 of hole) | | | | |
| | min | | 15.4 | | | | |
| | | | Dolomite - Light Grey | | | | |
| 16 | | | Hard - Silic - Slightly | | | | |
| | | | Frac with Fe stained | | | | |
| | 1 hr | | frac planes | | | | |
| | 17min | | 15.8 | | | | |
| | | | Dolomite - Grey - Hard | | Milky | | |
| | | | Highly Siliceous | | Brown | | |
| 17 | | | 16.7 | | | Smooth | |
| | 1 hr | | Dolomite - Brown - Hard | | | | |
| | 15min | | Very Hard - Highly | | | | |
| | | | Siliceous | | | | |
| | | | 17.1 - 17.15 | | | | |
| 18 | | | Shale Seam - Black - Soft | | | | 9/23/81 |
| 471.02 | | | 17.15 | | | | 9/24/81 |
| | 1 hr | | Dolomite - Grey - Hard | | | | Start 7:25 |
| | 24min | | Very Hard - Highly Siliceous | | | | Lake Elev. |
| | | | 18.3 | | | | 542.72' |
| 19 | | | Dolomite - Grey - Mod Hard | | | | 4th 27rpm |
| | | | Hard Slightly Silic | | | | w/H2O 116.9' |
| | 1 hr | | 18.9 Dolomite - Hard | | | | stem - Kelly |
| | 14min | | Very Hard - Grey - Brown | | | | PH Assembly |
| | | | Highly Siliceous | | | | |
| 469.22' 20 | | | | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor: Massman Construction Co. | | Sheet 3 of 3 SHEETS | |
|---|------------|----------------------------------|--|---|----------------|---------------------------|---|
| PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT | | | |
| 2 LOCATION H101-P10-East-Socket | | | | 11 Elevation of Bottom of Hole | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | | |
| 4 HOLE NO | | | | 13 Casing Record | | Depth Type | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 ELEVATION of Water | | | |
| 7 Boring Method Rotary dry | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 SIGNATURE OF INSPECTOR | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |
| ELEVATION | DEPTH | Drill Rate | CLASSIFICATION OF MATERIALS (Description) | Water Loss | Water Color | Drill Action | REMARKS |
| 469.22 | 20 | | | | | | 9/24/81 con't |
| | 1 hr 11min | | Dolomite - Grey - Brown Hard - Very Hard - Highly Siliceous 20.9-21.1 | | | | Lake Elev. 542.72' |
| | 21 | | Chert - Grey - Hard 21.7 | | Milky Brown | Smooth & DH Assembly | 4th 27rpm w/H2O 116.9' stem - kelly |
| | 1 hr 10min | | Dolomite - Light Brown Hard - Very Hard - Highly Siliceous 21.1 | | | | Stop 5:15 @26.0 |
| | 22 | | Dolomite - Grey - Hard Silic | | | | |
| | 1 hr 23min | | | | | | |
| | 23 | | 23.5 Dolomite - Grey - Light Brown - Mod Hard - Hard Silic | | | | |
| | 1 hr 24min | | | | | | |
| | 24 | | | | | | |
| | 1 hr 11min | | | | | | |
| | 25 | | 25.6 Dolomite - Grey - Mod Hard - Hard - Silic Slightly Frac with Fe Stained Frac Planes | | | | |
| 463.22 | 26 | | | | | | 9/24/81 9/25/81 |
| 462.8 | 1 hr 2min | | Bottom of Rock Socket | | | | Lake Elev. 542.62' |
| | 27 | | | | | | Start 7:40 4th 27rpm w/H2O 116.9' stem - kelly & DH Assembly Stop 8:42 PCH |

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APPENDIX C

CORE HOLE DRILLING LOGS

Pages 184 thru 282

| DRILLING LOG | | Project No. | Contractor | SHEET 1 of 2 SHEETS |
|---|--|--|------------------------------|------------------------|
| Norfolk Lake Bridges | | | Massmen Construction Company | |
| LOCATION of Boring 2.5' E & 1.5' S of center of footing | | 1. SIZE AND TYPE OF BIT HQ - Diamond Wireline | | |
| Geotechnician Robert Schmoker | | Boring No. | | |
| HOLE NO. R52-P1-N1 | | 2. MANUFACTURER'S DESIGNATION OF DRILL Longveer HC-150 | | |
| 3. NAME OF DRILLER Bob Walsh | | 4. Water Depth N/A | | |
| 5. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 6. TOTAL NUMBER CORE BOXES 1 | | |
| 7. Boring Method Rotary | | 8. Depth of Bottom of Hole | | |
| 9. DEPTH DRILLED INTO ROCK 11.8 | | 10. DATE HOLE 21 May 1980 22 May 1980 | | |
| 11. TOTAL DEPTH OF HOLE 11.9 | | 12. ELEVATION TOP OF HOLE 542.5 | | |
| ELEVATION DEPTH LEGEND: | | 13. TOTAL CORE RECOVERY FOR BORING 100% | | |
| CLASSIFICATION OF MATERIALS (Description) | | 14. Casing Record Depth 0.5 Type Fw | | |
| 1. CORE RECOVERY | | REMARKS | | |
| 2. BOX OR SAMPLE NO. | | 3. Drilling time, core loss, depth of weathering, etc., as significant | | |
| | | 21 May 1980 <u>Bot of Cas.</u> 22 May 80 0700 Run #1 HQ Bit - w/5' Core Bar Start 0810 Stop 0825 Amt Drilled 5.1 Amt Rec'd 5.1 Core Loss 0.0 Drill Action - Smooth Core in good shape Water return leaking out from under casing | 100% | 1 |
| D.D. 5.1 Run #2 HQ Bit Start 10:45 Stop 11:10 Amt. Drilled 5.1 Amt. Received 5.1 Core Loss 0.0 Drill Action - Smooth Water return leaking out from under casing | | 100% | | |

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| | | | | |
|---|--|---|--|------------------------|
| DRILLING LOG | | Project No. Rwy 62 Pier 1 | Contractor Massman Construction Company | SHEET 1 OF 2 SHEETS |
| 1. LOCATION OF BORING Norfolk Lake Bridges 2' South of Center of Footing | | 10. SIZE AND TYPE OF HQ - Diamond | | |
| 2. Geotechnician Robert Schmoker | | 11. Boring No. | | |
| 3. HOLE NO. 62-P1-S1 | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | |
| 4. NAME OF DRILLER Bob Walsh | | 13. Water Depth N/A | | |
| 5. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | 14. TOTAL NUMBER CORE BOXES 1 | | |
| 6. Boring Method Rotary | | 15. Depth of Bottom of Hole | | |
| 7. DEPTH OF LUG INTO ROCK 11.8 | | 16. DATE HOLE 27 May 1980 | | |
| 8. TOTAL DEPTH OF HOLE 11.8 | | 17. ELEVATION TOP OF HOLE 542.7 | | |
| 9. Casing Record Type HQ | | 18. TOTAL CORE RECOVERY FOR BORING 100% | | |
| ELEVATION DEPTH LEGEND | | REMARKS | | |
| CLASSIFICATION OF MATERIALS Description | | Drilling time, water used, depth of weathering, etc., if significant | | |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>542.7</p> </div> <div style="width: 35%;"> <p>DOLomite, HD, Gray, num healed fracs, Fe stained</p> <p>DOLomite, Mod hd, tan gray, num healed jts & fracs, Fe stained</p> <p>-Shly. Sl. wea.</p> <p>-Broken</p> <p>Soft</p> <p>DOLomite, mod hd, siliceous, med gray, num healed fracs, Fe stained, Sl. wea.</p> <p>DOLomite, hd, siliceous, med gray, num healed jts & fracs.</p> <p>-Tuggy</p> <p>DOLomite, mod. hd, tan gray, num fracs & jts., Fe stained</p> <p>-Broken</p> </div> <div style="width: 10%;"> <p>100</p> <p>100</p> <p>100</p> </div> </div> | | <p>Run #1 Bot. of Casing HQ Bit, 5' Core Bar Start 11:10 Stop 11:30 Amt Drilled 4.7 Amt Rec'd 4.7 Core Loss 0.0 Drill action - Smooth</p> <p>D.D. 4.7'</p> <p>Run #2 HQ Bit D.D. Start 12:55 5.0' Stop 1:00 Amt. Drilled 0.3' Amt. Rec'd 0.3' Core Loss 0.0 Drill Action Smooth -Malfunction in Mud pump</p> <p>Run #3 HQ Bit Start 2:20 Stop 2:35 Amt Drilled 4.6' Amt Rec'd 4.6' Core Loss 0.0 Drill Action - Smooth</p> <p>D.D. 9.6'</p> | | |

| | | | | | | | |
|--|-------|----------------------------------|--|---|-----------------------------|--|--|
| DRILLING LOG | | Project No. DATE OF RECORDING | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BQ - Diamond | | | |
| 11 LOCATION OF SPRING 2' South of Center of Footing | | | | 11 Spring No. | | | |
| 12 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 13 HOLE NO 62-P1-S1 | | | | 13 Water Depth N/A | | | |
| 14 NAME OF DRILLER Bob Walsh | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 15 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 Depth of Bottom of Hole | | | |
| 16 Drilling Method Rotary | | | | 16 DATE HOLE STARTED 27 May 1980 COMPLETED 27 May 1980 | | | |
| 17 DEPTH DRILLED INTO ROCK 11.8 | | | | 17 ELEVATION TOP OF HOLE 542.7 | | | |
| 18 TOTAL DEPTH OF HOLE 11.8 | | | | 18 TOTAL CORE RECOVERY FOR SPRING 100% | | | |
| | | | | 19 Casing Record Depth 0.2 Type B | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 2 CORE RECOV- EPY | BOX OR SAMPLE NO 1 | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 531.4 | | | Chert DOLOMITE (Cont.) | 100 | 1 | Run #6 HQ Bit Start 3:00 Stop 3:10 Amt Drilled 2.2 Amt Rec'd 2.2 Core Loss 0.0 | |
| | | | | | 11.3 | | |
| 530.9 | | | Core Discarded | | | Drill Action - Smooth M.D. 11.8' D.D. 11.8' | |
| | | | | | | BOR | |
| | | | | | | TV Inspection of core hole made 28 May 1980. | |

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| DRILLING LOG | | Project No. DACW 0 2-C-0055 | | Contractor Massman Const. Ion Company | | SHEET 1 OF 2 SHEETS | |
|--|------------|--------------------------------|--|--|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT RQ - Diamond | | | |
| 2. LOCATION OF Boring 62-P2-N-1-Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear RC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 471.75 | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 12/2/80 COMPLETED 12/3/80 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.45' | | | | 17. ELEVATION TOP OF HOLE 553.5 Platform | | | |
| 9. TOTAL DEPTH OF HOLE 81.65' | | | | 18. TOTAL CORE RECOVERY FOR BORING % | | | |
| | | | | 19. Casing Record Depth 71.0 Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 482.3 | 71 | | Bottom of Rock Socket | | | Run #1 Start: 12/2/80 @2.25 M.D. Start: 71.2' Stop: 2:45 M.D. Stop 75.15 D.D. 3.95' Rec 3.90'-99% | |
| | 72 | | Dolomite, mod. hd, lt. gray to tan, mod. fractured with partings along thin, tan to brown shale seams, some Fe stains. | | | | |
| | 73 | | Shale, mod. soft, gry-brn, 1/4" thick | 99 | | | |
| | 74 | | Very shaley | | | 12/3/80 Start: 7:35 M.D. Start: 75.15 Stop: 7:55 M.D. Stop: 79.88 D.D. 4.93' Rec. - 4.73' - 100% | |
| 478.35 | 75 | | Dolomite, mod. hd, occ. fractures and joints, lt. gray to gray, occ. dk. gray shale interbeds. | | | | |
| | 76 | | Very shaley | | | | |
| | 77 | | Very shaley | | | | |
| | 78 | | Fe staining | | | | |
| | 79 | | | 100 | | | |
| 473.62 | | | | | | | |

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| DRILLING LOG | | Project No. DACH 62-79-C-0055 | | Contractor Hassman Construction Company | | SHEET 2 OF 2 SHEETS | |
|--|-------|----------------------------------|--|--|-------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE 1/2" HO - Diamond | | | |
| 2 LOCATION of Boring 62-P2-N-1-Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Type _____ Depth _____ | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 80.6 | | | Dolomite, as above. | | | Run#3 Start: 8:22 M.D. Start: 79.88 Stop: 8:28 M.D. Stop: 81.65 D.D 1.77' Rec. 1.77' - 100% | |
| 91 | | | Shale, dk gray, 1/4" thick | 100 | 1 | | |
| 471.85 | | | Bottom of Core Hole | | | | |

| DRILLING LOG | | Project No. DACH 79-C-0055 | Contractor Massman Construction Company | SHEET 1 OF 2 SHEETS | | |
|---|------------|--|--|-------------------------|------------------------------|--|
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | | |
| 2 LOCATION of Boring 62-P2-S-1-Core | | 11 Boring No. | | | | |
| 3 Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | | |
| 4 HOLE NO. | | 13 Water Depth | | | | |
| 5 NAME OF DRILLER Bob Walsh | | 14 TOTAL NUMBER CORE BOXES 1 | | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15 Depth of Bottom of Hole 472.2 | | | | |
| 7 Boring Method Rotary | | 16 DATE HOLE STARTED 12/4/80 COMPLETED 12/4/80 | | | | |
| 8 DEPTH DRILLED INTO ROCK 10.165' | | 17 ELEVATION TOP OF HOLE 553.29 | | | | |
| 9 TOTAL DEPTH OF HOLE 80.89' | | 18 TOTAL CORE RECOVERY FOR BORING | | | | |
| | | 19 Casing Record Depth 71.45' Type RW | | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
| 482.52 | | | Bottom of Rock Socket | | | |
| | 71 | | Dolomite, mod. hd, lt. gray to gray, occ. minute vugs with calcite crystals, moderately fractured. Broken | | | Run#1 Start - 9.42 M.D. Start - 70.725 Stop: 10.12 M.D. Stop - 75.25 D.D. - 4.525' Rec. - 4.325' C.L. - .2' |
| | 72 | | - Cherty | 96 | | |
| | 73 | | Vertical joint is cemented and tightly healed. | | | |
| | 74 | | Shale, firm to soft, lt. gray to tan to brown, fissile, air-slaked. | | | |
| | 75 | | - Broken along bedding planes of soft, fissile, air-slaked shale. 0.2' C.L. Sandstone, mod. hd, fn grn, angular to subangular, tan, slightly rough texture. | | | |
| 478.04 | | | | | 1 | |
| | 76 | | Dolomite, mod. hd, gray, occ. fractures, sandy with small dolomitic sandstone layer from 76.55 to 76.80 and dk. gray to black shale from 76.80 to 76.98. | | | Run#2 Start - 10.29 M.D. Start - 75.25 Stop - 10.40 M.D. Stop - 80.15 D.D. - 4.9' Rec. - 4.9' C.L. - 0.0' |
| | 77 | | Sandstone interbed Shale interbed | | | |
| | 78 | | Shaley, dk. gray Dolomite, mod. hd, lt. gray to gray to buff, occ. fractures on nearly horizontal bedding planes, smooth texture. | 100 | | |
| | 79 | | - Sandy, rough texture | | | |
| | 80 | | | | | |

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| | | | | | | | |
|---|------------|--------------------------------|---|--|------------------------------|---|--|
| DRILLING LOG | | Project No. DACHS 79-C-0055 | | Contractor Hagman Const. Co. Inc. | | SHEET 1 OF 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P2-S-1-Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Type _____ Depth _____ | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV. e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 473.14 | 80 | | Dolomite, as above. | 100 | 1 | Start: 10.5 M.D. Start 80.15 Stop: 11.01 M.D. Stop: 80.89 D.D. 74' M.D. 74' C.L. 0.0' | |
| 472.4 | 81 | | Bottom of Core Hole | | | | |

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| DRILLING LOG | | Project No. DACW 0 9-C-0055 | | Hole No. 62-P3-N3 | | SHEET 1 OF 2 SHEETS | |
|--|------------|--------------------------------|---|--|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring Pier 3, North Socket, Near Center | | | | 11. Boring No. 62-P3-N3 | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4. HOLE NO. 62-P3-N3 | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 126.55 | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 7-8-80 COMPLETED 7-8-80 | | | |
| 8. DEPTH DRILLED INTO ROCK 11.7 | | | | 17. ELEVATION TOP OF HOLE 564.94 (Top/Casing) | | | |
| 9. TOTAL DEPTH OF HOLE 126.55 | | | | 18. TOTAL CORE RECOVERY FOR BORING 94.02 | | | |
| | | | | 19. Casing Record Depth Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | | | Top of Casing = Top of Hole | | | 8 a.m. Lake Surface Elevation 550.43 | |
| 111 | | | | | | | |
| 112 | | | | | | | |
| 113 | | | | | | | |
| 114 | | | | | | | |
| 450.1 | | | Bottom of Rock Socket | | | Begin Coring 114.85 | |
| | 115 | X | 0.7' C.L. | | | Run #1 HQ Bit, 5' Core Barrel Start 8:44 Stop 8:53 Amt Cored 1.7' Amt Rec'd 1.0' C.L. 0.7' Loss of water when pull down is used d.d. 116.55 | |
| | 116 | | Dolomite, Hd, med gray, num healed jts & fracs Fe stained, | 58.8 | | | |
| | 117 | | Broken | | 1 | Run #2 Start 9:30 (No pull down - control in float position) Stop 10:50 Amt Cored 5.0' Amt Rec'd 5.0' HD Dolomite - Core fractured where jointed. | |
| | 118 | | | | | | |
| | 119 | | | | | | |
| | 120 | | | | 100 | | |

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| DRILLING LOG | | Project No. DACW 0 9-C-0055 | | Contractor Massman Consty Lion Company | | SHEET 1 OF 2 SHEETS | |
|---|------------|--------------------------------|---|---|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION OF Boring | | | | 11. Boring No. 62-P3-N3 | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. 62-P3-N3 | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth _____ Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 121 | | Dolomite (cont) | | | Drill Action Smooth | |
| | 122 | Broken | | | | D.D. 116.55 | |
| | 123 | | | | 1 | Run#3 Start 11:35 Stop 12:30 Amt Cored 3.0' Amt Rec'd 3.0' | |
| | 124 | Vuggy, w/Calcite Crystals | | 100 | | Drill action Smooth No pull down | |
| | 125 | | | | | D.D. 124.55 MD 124.55 | |
| | 126 | Scatt. Vugs | | 100 | | Run #4 Start 1:50 Stop 2:15 Amt Cored 2.0' Amt Rec'd 2.0' Drill action smooth HD Dolomite - Num Healed Fracs D.D. 126.55 MD 126.55 | |
| 438.39 | | | | | | Bottom of Hole | |
| | 127 | | | | | TV Inspection made of Core Hole 7-9-80 @ 11:30 a.m. | |
| | 128 | | | | | | |
| | 129 | | | | | | |
| | 130 | | | | | | |

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| DRILLING LOG | | Project No. DACW C '9-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|--|------------|---------------------------------|--|--|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION OF BORING Pier 3, South Socket, Near Center | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. 62-P3-S1 | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 440.0' | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 7/10/80 COMPLETED 7/11/80 | | | |
| 8. DEPTH DRILLED INTO ROCK 12.8' | | | | 17. ELEVATION TOP OF HOLE 566.32 (Top casing) | | | |
| 9. TOTAL DEPTH OF HOLE 127.0' | | | | 18. TOTAL CORE RECOVERY FOR BORING 98.3 | | | |
| | | | | 19. Casing Record Depth Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 110.0 | | Top of Hole = Top of Casing | | | | |
| | 111 | | | | | | |
| | 112 | | | | | | |
| | 113 | | | | | | |
| | 114 | | | | | | |
| | 115 | | | | | Begin Coring 115.2' | |
| 451.12 | | | | | | | |
| 451.0 | | | | | | | |
| Bottom of Rock Socket | | | | | | | |
| | 116 | - 0.2' C.L. | DOLOMITE, Hd, Tan- Gray, num healed fracs & jts., Fe stained, Scattered Vugs | 86.7 | | Run #1 HQ Bit - 5' Core Barrel Start 1:55 Stop 2:10 Amt Cored 1.5' Amt Rec'd 1.3' C.L. 0.2' Drilled in float Muddy water & fast drill rate @.6' - 1.0' D.D. 116.9 M.D. 116.7 | |
| | 117 | | | | 1 | | |
| | 118 | | | 100 | | Run #2 Start 2:42 Stop 3:05 Amt Cored 5.1' Amt Rec'd 5.1' C.L. 0.0 Drilled in pull-down | |
| | 119 | | | | | | |
| | 120 | | | | | | |

194

| DRILLING LOG | | Project No. DACW 0 9-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|--|------------|---------------------------------------|--|--|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF HQ - Diamond | | | |
| 2. LOCATION of Boring | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING % | | | |
| | | | | 19. Casing Record Depth _____ Type _____ HW _____ | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 120.0 | | DOLOMITE (Cont) | | | | |
| | 121 | | Num Vugs Lined w/ Qtz & Dolo X-tls | | | | |
| | 122 | | | | | D.D. 131.8 M.D. 121.8 | |
| | 123 | | | | 1 | Run #3 Start 7:43 Stop 7:55 @ 3' (Add 5' joint) Start 8:00 Stop 8:09 Amt Cored 5.2' Amt Rec'd 5.2' C.L. 0.0' | |
| | 124 | | DOLOMITE, Hd. med gray, num healed fracs & jts Fe stained | 100 | | | |
| | 125 | | | | | | |
| | 126 | | Num Small Vugs | | | | |
| 439.3' | 127 | | Bottom of Hole 127.0' | | | D.D. 127.0 M.D. 127.0 | |
| | 128 | | | | | Made TV Inspection of core hole 11 July '90 @ 11:30 a.m. | |
| | 129 | | | | | | |
| | 130 | | | | | | |

195

| DRILLING LOG | | DIVISION | | INSTALLATION | | Hole No. | | SHEET 1 | |
|--|-------|----------|---|--|-------------------|--|--|----------------------|--|
| DA 03-79-C-0055 | | Massman | | Contractor | | Instruction | | OF 2 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | | | |
| 2. LOCATION (Coordinates or Station) H62-P4 -N-Core | | | | 11. DAYUM FOR ELEVATION SHOWN (TBM = MSL) | | | | | |
| 3. DRILLING AGENCY | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC - 150 | | | | | |
| 4. HOLE NO. (As shown on drawing title and file number) | | | | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | | DISTURBED | | UNDISTURBED | |
| 5. NAME OF DRILLER Bob Walch | | | | 14. TOTAL NUMBER CORE BOXES | | 15. ELEVATION GROUND WATER | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 16. DATE HOLE | | STARTED 1/14/81 | | COMPLETED 1/14/81 | |
| 7. THICKNESS OF OVERBURDEN | | | | 17. ELEVATION TOP OF HOLE 557.78' Platform | | | | | |
| 8. DEPTH DRILLED INTO ROCK 10.15' | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | | | |
| 9. TOTAL DEPTH OF HOLE 141.0' | | | | 19. SIGNATURE OF INSPECTOR | | | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | | | |
| 426.93 | 130 | | Bottom of Rock Socket | | | | | | |
| | 131 | | Dolomite, mod. hd. to hd., lt. gray to gray with a few dk. gray 1/16" to 1/8" thick shale layers, mod. fractured for most part, greatly fractured from 138.2 to 139.9, joints mostly healed with calcite, vuggy and drusy from 136.55 to 139.70, occ. Fe stains along joints and in vugs. | 94 | | Run #1 Start 7:41 Stop 8:18 M.D. Start 130.85' M.D. Stop 133.3' D.D. 2.45' REC 2.30' C.L. .15' | | | |
| 424.48 | 132 | | | | | | | | |
| | 133 | | | | | | | | |
| | 134 | | | | | Run #2 Start 8:42 Stop 9:18 fuel put Start 9:29 Stop 9:41 M.D. Start 133.3' M.D. Stop 138.2' D.D. 4.9' REC 4.9' C.L. 0.0' | | | |
| | 135 | | | 100 | 1 | | | | |
| | 136 | | broken | | | | | | |
| | 137 | | druses with dolomite crystals | | | | | | |
| | 138 | | vugs with quartz crystals | | | | | | |
| 419.58 | 139 | | broken | | | | | | |
| | 140 | | druse with dolomite crystal | | | | | | |
| | | | broken | 100 | | Run #3 Start 10:00 Stop 10:40 M.D. Start 138.2' M.D. Stop 141.0' D.D. 2.8' REC 2.8' C.L. 0.0' | | | |

| DRILLING LOG | | Proj. No. DACW 43-79-C-0055 | | Contractor Massman Construction Co. | | Hole No. SHEET 1 OF 2 SHEETS | |
|--|-------|--------------------------------|---|--|-------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT H0 - Diamond | | | |
| 2. LOCATION of Boring H62-P4-S-1 | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | DISTURBED 115.30 UNDISTURBED | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE | | STARTED 1/21/81 COMPLETED 1/21/81 | |
| 8. DEPTH DRILLED INTO ROCK 10.03' | | | | 17. ELEVATION TOP OF HOLE 558.28' TOP | | | |
| 9. TOTAL DEPTH OF HOLE 141.35 | | | | 18. TOTAL CORE RECOVERY FOR BORING 3 | | | |
| | | | | 19. Casing Record | | Depth 132' Type HW | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 1. CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 130 | | | | | | | |
| 131 | | | | | | | |
| 426.96' | | | Bottom of Rock Socket | | | | |
| 132 | | | Dolomite, hd. to mod. hd., lt. gray to gray with buff banding from 135.55 to 136.00, occ. 1/16" thick dk. gray shaly layers, moderately fractured and jointed, joints mostly healed, vuggy or drusy in places. | 100 | | Run #1 M.D. Start 131.32' M.D. Stop 135.09' Start 12:53 Stop 1:19 D.D. 3.77' REC. 3.77' C.L. 0.0' | |
| 133 | | | | | | | |
| 134 | | | | | | | |
| 423.19 | | | | | | | |
| 135 | | | | | 1 | Run #2 M.D. Start 135.09' M.D. Stop 140.1' Start 1:33 Stop 1:52 D.D. 5.01 REC. 4.9 C.L. .11 | |
| 136 | | | druses with dolomite crystals | | | | |
| 137 | | | broken vugs with quartz crystals | 98 | | | |
| 138 | | | druse with dolomite crystals | | | | |
| 139 | | | broken, drusy with dolomite crystals | | | | |
| 140 | | | 0.11' core loss in clay- filled cavity. | | | | |

198

| DRILLING LOG | | Project No. DACW 79-C-0055 | | Contractor Massman Const. Lion Company | | SHEET 1 OF 2 SHEETS | |
|--|------------|-------------------------------|---|--|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION OF Boring Buy 62-Pier 5-N Socket - Near Center | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4. HOLE NO. 62-P5-W1 | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 7/31/80 COMPLETED 8/1/80 | | | |
| 8. DEPTH DRILLED INTO ROCK 11.4 | | | | 17. ELEVATION TOP OF HOLE 562.1' Top of casing & Top of platform | | | |
| 9. TOTAL DEPTH OF HOLE 11.4 | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth 156.45' Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV. e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 407.1 | 155 | | Bottom of Rock Socket | | | | |
| | 156 | | Dolomite, Hd, Med gray, num healed jts & fracs, occ Fe staining | 100 | | Run #1 Start 1:28 Stop 1:34 Amt Cored 2.0' Amt Rec'd 1.8' MD 155.0 - 156.8' DD 155.0 - 157.0' | |
| | 157 | | Broken | 100 | 1 | Run #2 Start 2:01 Stop 2:07 Amt Cored 1.0' Amt Rec'd 1.2' MD 156.8 - 158.0 DD 157.0 - 158.0 | |
| | 158 | | | | | | |
| | 159 | | Broken | 100 | | Run #3 Start 8:48 Stop 9:08 Amt Cored 5.2' Amt Rec'd 5.2' MD 163.2 DD 163.2 | |
| | 160 | | | | | | |
| | 161 | | | | | | |
| | 162 | | Vuggy | | | | |

| | | | | | | |
|--|--|---------------------------------|--|--|--|------------------------|
| DRILLING LOG | | Project No. DACW / 79-C-0055 | | Contractor Massman Constr. Co. Inc. | | SHEET 1 OF 2 SHEETS |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | |
| 2. LOCATION of Boring Pier 5 - South Socket - Near Center | | | | 11. Boring No. 62.P5-S1 | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | |
| 4. HOLE NO. 62-P5-S1 | | | | 13. Water Depth | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | |
| | | | | 16. DATE HOLE STARTED 7/29/80 COMPLETED | | |
| 7. Boring Method Rotary | | | | 17. ELEVATION TOP OF HOLE 567.45' T.O. Casing | | |
| 8. DEPTH DRILLED INTO ROCK 11.0' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100 % | | |
| 9. TOTAL DEPTH OF HOLE 11.0' | | | | 19. Casing Record Depth 161.45' Type HW | | |

| ELEVATION e | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|---|------------------------------|------------------------------|---|
| 406.75 | 1 | | | | | |
| | 2 | | | | | |
| | 160 | | | | | |
| | | | Bottom of Rock Socket | | | Begin Boring 160.7 |
| | 161 | | 0.2' C.L. Dolomite, med Hd w/soft chalky seams and swirls, med gray to buff, mottled, broken w/nearly horizontal jts, some Fe staining | 80 | | Run #1 Start 8:05 Stop 8:10 Amt Cored 1' Amt Rec'd 1' DD 161.7' MD 161.7' |
| | 162 | | Dolomite, Hd, med gray, num jts and fracs mostly healed, frequent Fe stained, occ vugs w/calcite crystals | | | Run #2 Start 9:12 Stop 9:36 Amt Cored 4.5' Amt Rec'd 4.5' DD 166.2 MD 166.2 |
| | 163 | | | 100 | 1 | |
| | 164 | | | | | |
| | 165 | | | | | |
| | 166 | | | 100 | | Run #3 Start 10:30 Stop 10:45 Amt Cored 2.0' Amt Rec'd 2.0' DD 168.2 MD 168.2 |
| | 167 | | | | | |

| DRILLING LOG | | Project No. DACW / 79-C-0055 | | Contractor Massman Constr. Co. Inc. | | SHEET 2 OF 2 SHEETS | |
|--|--|---------------------------------|--|--|--|--------------------------|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO 62-P5-S1 | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 8 DEPTH DRILLED INTO ROCK | | | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 Casing Record | |
| 9 TOTAL DEPTH OF HOLE | | | | Type | | HW | |

| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|---|------------------------------|------------------------------|---|
| | 168 | | Dolomite (Cont) | | | Run #4 Start 11:12 Stop 11:45 Amt Cored 3.5' Amt Rec'd 3.5' DD 171.7' MD 171.7' |
| | | | - Scatt. vugs w/calcite crystals | | | |
| | 169 | | - Fracture, irregular to vertical, contains Fe stain & calcite crystals | | 1 | |
| | 170 | | - Scatt. vugs w/calcite crystals | 100 | | |
| | 171 | | - Vuggy w/Calcite crystals | | | |
| | | | Bottom of Hole 395.75 | | | |

203


Hole No.

| DRILLING LOG | | Project No. DACW -79-C-0055 | | Contractor Masstar Construction Co. | | SHEET 1 OF 2 SHEETS | |
|---|------------|--------------------------------|--|--|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HO - Diamond | | | |
| 2. LOCATION of Boring 62-P6-N-1-Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth DISTURBED UNDISTURBED | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 2/5/81 COMPLETED 2/5/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.2 | | | | 17. ELEVATION TOP OF HOLE 556.46' Platform | | | |
| 9. TOTAL DEPTH OF HOLE 156.85 | | | | 18. TOTAL CORE RECOVERY FOR BORING 3 | | | |
| | | | | 19. Casing Record Depth 147.0' Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVER- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 140 | | | | | | | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 143 | | | | | | | |
| 144 | | | | | | | |
| 145 | | | | | | | |
| 146 | | | | | | | |
| 409.81 | | | Bottom of Rock Socket | | | | |
| 147 | | | Dolomite, mod. hd., lt. gray with occ. buff to gray-white mottling, frequently fractured and jointed with some FE staining and calcite crystals. | | | Run #1 MD Start 146.65' MD Stop 150.32' Start 9:45 Stop 10:25 DD 3.67' REC 3.57' CL .10' | |
| 148 | | | Shale, 1/16" thick, brown. Vugs with quartz crystals Flint, black to dk. brown | 97 | 1 | | |
| 149 | | | | | | | |
| 150 | | | | | | | |

204

| DRILLING LOG | | Project No. DACW -79-C-0055 | | Contractor Massman Construction Co. | | Hole No. SHEET 2 OF 2 SHEETS | |
|---|-------|--------------------------------|--|---|-------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT H0 - Diamond | | | |
| 2. LOCATION of Boring 62-P6-N-1-Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | DISTURBED UNDISTURBED | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE | | STARTED COMPLETED | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth Type | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 406.14' | 150 | | Dolomite, as above. | | | Run #1 | |
| | 151 | | Broken | | | Run #2 | |
| | | | | | | MD Start 150.32' | |
| | | | | | | MD Stop 155.23' | |
| | | | | | | Start 10:43 | |
| | | | | | | Stop 11:03 | |
| | | | | | | DD 4.91' | |
| | | | | | | REC 4.91' | |
| | | | | | | CL 0.0' | |
| | 152 | | | 100 | 1 | | |
| | 153 | | | | | | |
| | 154 | | | | | | |
| | 155 | | Broken | | | | |
| 401.23' | | | | | | Run #3 | |
| | 156 | | | 100 | | MD Start 155.23' | |
| | | | | | | MD Stop 156.85' | |
| | | | | | | Start 11:20 | |
| | | | | | | Stop 11:30 | |
| | | | | | | DD 1.62' | |
| | | | | | | REC 1.62' | |
| | | | | | | CL 0.0' | |
| 399.61' | | | Bottom of Core Hole | | | | |
| | 157 | | | | | | |
| | 158 | | | | | | |
| | 159 | | | | | | |
| | 160 | | | | | | |

205

| DRILLING LOG | | Project No. | | Contractor | | Hole No. | |
|---------------------------|-------|---|---|--|-----------------------|---|--|
| | | DAGW 1-74-C-0055 | | Massman Construction Co. | | SHEET 1 OF 2 SHEETS | |
| 1 PROJECT | | Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT | | HC - Diamond | |
| 2 LOCATION | | of Boring 62-P6-S-1-Rock Core | | 11 Boring No. | | | |
| 3 Geotechnician | | Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL | | Longyear HC 150 | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | Bob Walsh | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE | | <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15 Depth of Bottom of Hole | | 397.98' | |
| 7 Boring Method | | Rotary | | 16 DATE HOLE | | STARTED 2/13/81 COMPLETED 2/13/81 | |
| 8 DEPTH DRILLED INTO ROCK | | 10.0' | | 17 ELEVATION TOP OF HOLE | | 555.83' TOP | |
| 9 TOTAL DEPTH OF HOLE | | 157.85' | | 18 TOTAL CORE RECOVERY FOR BORING | | 100 | |
| | | | | 19 Casing Record | | Depth 148.45' Type HW | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOV- ERY | BOX OR SAMPLE # | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 140 | | | | | | | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 143 | | | | | | | |
| 144 | | | | | | | |
| 145 | | | | | | | |
| 146 | | | | | | | |
| 147 | | | | | | | |
| 407.98' | | | Bottom of Rock Socket | | | | |
| 148 | |  | Dolomite, mod. hd., gray to lt. gray with occ. gray-white to buff mottling, frequently fractured and jointed with some dolomite and calcite healing, occ. slight FE staining along joint planes, druses and vugs in places. | 100 | 1 | Run #1 MD Start 147.85' MD Stop 150.45' Start 8:11 Stop 8:38 DD 2.6 REC 2.6 CL 0.0 | |
| 149 | | | | | | | |
| 150 | | | | | | | |

206

| DRILLING LOG | | Project No. DACW -79-C-0055 | | Contractor Massman Construction Co. | | Hole No. SHEET 2 OF 2 SHEETS | |
|---|--|--------------------------------|--|---|--|------------------------------------|--|
| 1. LOCATION Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P6-S-1-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth DISTURBED UNDISTURBED | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BORES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED COMPLETED | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth Type | | | |

| ELEVATION + | DEPTH - | LEGEND | CLASSIFICATION OF MATERIALS (Description) | CORE RECOVERY % | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|----------------|------------|--------|--|-----------------------|-------------------------|--|
| 405.38' | 150 | | Dolomite, as above. | 100 | | Run #1 - con't. |
| | 151 | | | | | Run #2 |
| | | | | | | MD Start 150.45' |
| | | | | | | MD Stop 155.40' |
| | | | | | | Start 8:52 |
| | | | | | | Stop 9:12 |
| | | | | | | DD 4.95 |
| | | | | | | REC 4.95 |
| | | | | | | CL 0.0 |
| | 152 | | | | | |
| | | | Druses with dolomite crystals | 100 | 1 | |
| | 153 | | | | | |
| | 154 | | Broken | | | |
| | | | Druses with dolomite crystals | | | |
| | 155 | | | | | |
| 400.43' | | | Broken | | | |
| | 156 | | | 100 | 1 | Run #3 |
| | | | | | | MD Start 155.4 |
| | | | | | | MD Stop 157.85 |
| | | | | | | Start 9:29 |
| | | | | | | Stop 9:38 |
| | | | | | | DD 2.45 |
| | | | | | | REC 2.45 |
| | | | | | | CL 0.0 |
| | 157 | | Broken | | | |
| | | | | | | |
| 397.98 | | | Vugs with quartz crystals | | | |
| | 158 | | Bottom of Hole | | | |
| | | | | | | |
| | 159 | | | | | |

| DRILLING LOG | | Project No. DACW 79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|---|------------|-------------------------------|---|--|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P7-N-1-Core | | | | 11. Boring No. 1 | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Mike Troxel | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 9/17/80 COMPLETED 9/19/80 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.95' | | | | 17. ELEVATION TOP OF HOLE 554.94' | | | |
| 9. TOTAL DEPTH OF HOLE 157.0' | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth 147.45' Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVER- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 143 | | | | | | | |
| 144 | | | | | | | |
| 145 | | | | | | | |
| 408.89' | 146 | | Bottom of Rock Socket | | | | |
| | 147 | | Dolomite, mod hd., gray to lt. gray, num tight fracs and jts., occ thin shale lay- ers of 1/16" thickness w/ small pyrite crystals. | 100 | 1 | Run #1 Start 9/17/80 - Float @ 3:25 Stop - 4:20 @ 1.0' Start - 9/18/80 - Float @ 7:50 Stop - 9:20 @ 1.48' MD 1.48' 146.07' DD 1.48' 147.53' CL 0.0' | |
| 407.41' | 148 | | Broken | | | Run #2 Start: 10:44 Stop: 12:05 M.D. 4.66' DD 4.66' | |
| | 149 | | | 100 | 1 | 147.53' - 152.19' | |
| | 150 | | | | | | |

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| DRILLING LOG | | Project No. DACH C 79-C-0055 | | Contractor Hassman Const tion Company | | SHEET 2 OF 2 SHEETS | |
|---|------------|---------------------------------|---|---|------------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P7-N-1-Core | | | | 11 Boring No. 1 | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Troxel | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| | | | | 16 DATE HOLE STARTED 9/17/80 COMPLETED 9/19/80 | | | |
| 7 Boring Method Rotary | | | | 17 ELEVATION TOP OF HOLE 554.94' | | | |
| 8 DEPTH DRILLED INTO ROCK 10.95' | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 9 TOTAL DEPTH OF HOLE 157.0' | | | | 19 Casing Record Depth 147.45' Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 151 | | Dolomite, as above, gray to buff w/Fe stains on jts & frags. Shale Layers, 1/16" thick, num. | 100 | 1 | | |
| 402.75' | 152 | | | | | | |
| | 153 | | Dolomite, mod hd to hd, gray to lt. gray, num.fracs. mostly healed with calcite, occ. tight jts., scattered chert w/occ. layers 1/16"-1/4" thick. | 100 | 1 | Run #3 Start: 1:22 Stop: 2:50 M.D. 1.46 D.D. 1.46 152.19' - 153.65' | |
| 401.29' | 154 | | Very Broken, frac.chert zone. Vug w/calcite | | | | |
| | 155 | | | 100 | 1 | Run #4 Start: 3:40 Stop: 4:10 Start: 7:20 (9/19/80) Stop: 7:30 @ 3.35' B.O.H. M.D. 3.35' D.D. 3.35' C.L. 0.0 153.65' - 157.0' | |
| | 156 | | Vugs and irregular frags. w/calcite | | | | |
| 397.94' | 157 | | Bottom of Hole | | | | |

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| | | | | |
|--|--|--|--|------------------------|
| DRILLING LOG | | Project No. DACS 07-79-C-0055 | Contractor Massman Construction Company | SHEET 1 of 2 SHEETS |
| 1. PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE HQ - Diamond | | |
| 2. LOCATION of Boring 62-P7-S-3 | | 11. Boring No. 3 | | |
| 3. Geotechnician Robert Schmoker | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | |
| 4. HOLE NO. | | 13. Water Depth | | |
| 5. NAME OF DRILLER Mike Troxel | | 14. TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15. Depth of Bottom of Hole | | |
| 7. Boring Method Rotary | | 16. DATE HOLE STARTED 9/16/80 COMPLETED 9/16/80 | | |
| 8. DEPTH DRILLED INTO ROCK 10.4' | | 17. ELEVATION TOP OF HOLE 555.43' | | |
| 9. TOTAL DEPTH OF HOLE 398.16' | | 18. TOTAL CORE RECOVERY FOR BORING | | |
| | | 19. Casing Record Depth 147.45' Type HW | | |

| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVER- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|---|--------------------------------|------------------------------|--|
| 141 | | | | | | |
| 142 | | | | | | |
| 143 | | | | | | |
| 144 | | | | | | |
| 145 | | | | | | |
| 146 | | | | | | |
| 408.56 | | | | | | |
| 147 | | | Dolomite, mod hd, gray to lt. gray, occ. tight jts. and fracs. w/Fe stains, occ. vugs | | | Run #1 M.D. 146.87' Start: 11:33 Float Stop: 12:30 Start: 1:05 Down Stop: 1:30 Add 5' @ 4'0" |
| 148 | | | Broken | | | Start: 1:35 Stop: 1:45 @ 5' |
| 149 | | | Small Vugs | 100 | 1 | M.D. 152.07 D.D. 152.07 C.L. 0.0 |

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| DRILLING LOG | | Project No. DACH 07-79-C-0055 | | Contractor Maxeman Construction Company | | SHEET 2 OF 2 SHEETS | |
|---|------------|----------------------------------|--|---|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE 1T HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P7-S-3 | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING 3 | | | |
| | | | | 19. Casing Record Depth _____ Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | 1 CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 151 | | Shale, mod soft, gray, 1/8" thick Dolomite, mod hd, lt. gray to buff, occ. tight jts. and fracs. w/Fe stains. | 100 | 1 | | |
| 403.36 | 152 | | | | | Run #2 | |
| | 153 | | Dolomite, mod hd, lt. gray w/ soft buff chalky mottling, jts. and fracs. as above. | | | Start: 2:30 Stop: 2:30 - Stem Adj Start: 2:34 Stop: 3:00 - Stem Adj Start: 3:04 Stop: 3:36 | |
| | 154 | | Very broken w/chert nodules | 100 | 1 | M.D. 5.2' D.D. 5.2' C.L. 0.0' | |
| | 155 | | Vuggy | | | | |
| | 156 | | Dolomite, mod hd, gray to lt. gray, occ. jts. and fracs., vuggy, calcite in vugs and along healed fracs. | | | | |
| 398.15 | 157 | | Bottom of Hole | | | | |

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| | | | | | | | |
|--|--|----------------------------------|--|--|--|-------------|--|
| DRILLING LOG | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | OF 2 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P8-N-1-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 395.28' | | | |
| 7. Boring Method Reverse Rotary | | | | 16. DATE HOLE STARTED 3/28/81 COMPLETED 3/28/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.25' | | | | 17. ELEVATION TOP OF HOLE 560.18 TBP | | | |
| 9. TOTAL DEPTH OF HOLE 164.9' | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth 155.45' Type HW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVER- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|---|---------------------------|-------------------------|--|
| 150 | | | | | | |
| 151 | | | | | | |
| 152 | | | | | | |
| 153 | | | | | | |
| 154 | | | | | | |
| 405.53' | | | Bottom of Rock Socket | | | |
| 155 | | | 0.05 Core loss | | | |
| | | | Broken | | | |
| 156 | | | Dolomite, mod. hd., light gray to gray, frequent fractures and joints often healed with calcite, occ. vugs with calcite crystals. | 99 | 1 | Run #1 Start 9:59 Stop 10:35 MD Start 154.65' MD Stop 159.35' DD 4.70 REC 4.65 CL .05 |
| 157 | | | | | | |
| | | | Vugs with calcite crystals | | | |
| 158 | | | | | | |
| 400.83' | | | | | | |
| 159 | | | | | | |
| 160 | | | | 100 | | Run #2 Con't on page two |

| | | | | | | | |
|---|--|----------------------------------|--|---|--|------------------------|--|
| DRILLING LOG | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | Sheet 4 of 2 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P8-N-1-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED COMPLETED | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth Type HW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|--|-----------------|-------------------|--|
| 160.0 | | | Vugs with calcite crystals Dolomite as above. | | | Run #2 159.35' - 164.0' Start 10:54 Stop 11:14 MD Start 159.35 MD Stop 164.0 DD 4.65 REC 4.65 CL 0.0 |
| 161.0 | | | Vug with calcite crystals. | 100 | 1 | |
| 162.0 | | | Vug with calcite crystals. | | | |
| 163.0 | | | | | | |
| 396.18 | 164.0 | | | 100 | | Run #3 Start 11:35 Stop 11:40 DD 9' REC .9 CL 0.0 MD Start 164.0 MD Stop 164.9' |
| 395.28' | | | Bottom of Core Hole | | | |

| | | | | | | | |
|--|--|----------------------------------|--|---|--|-------------|--|
| DRILLING LOG | | Project No. DACW 07-79-C-0055 | | Contractor Massman Construction Company | | Of 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P8-S-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4 HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16. DATE HOLE STARTED 3/26/81 COMPLETED 3/26/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.24 | | | | 17. ELEVATION TOP OF HOLE 556.59 | | | |
| 9 TOTAL DEPTH OF HOLE 161.05 | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth 151.45 Type HW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|--|--------------------|------------------------|--|
| 150 | | | | | | |
| 405.78 | | | Bottom of Rock Socket | | | |
| 151 | | | 0.09 Core loss Broken | | | Run #1 MD Start 150.81 MD Stop 155.2 DD 4.39 REC 4.3 CL .09 |
| 152 | | | Dolomite, Mod. hd., light gray to gray with some buff mottling from 150.81 to 152.20, frequent fractures and joints often healed with calcite or iron, occ. druses or vugs. | 98 | 1 | |
| 153 | | | | | | |
| 154 | | | | | | |
| 401.39 | | | | | | |
| 155 | | | | | | Run #2 MD Start 155.2 MD Stop 159.95 .DD 4.75 REC 4.75 CL 0.0 |
| 156 | | | | | | |
| 157 | | | Broken | 100 | | |
| 158 | | | | | | |
| 159 | | | Druses with dolomite crystals | | | |
| 396.64 | 160 | | | | | |

| DRILLING LOG | | Project No. DACH 07-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
|--|-------|----------------------------------|--|--|-------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE 11T HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P8-S-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth _____ Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 160 | | | Dolomite as above. | 100 | 1 | Run #3 MD Start 159.95 MD Stop 161.05 DD 1.1 REC 1.1 CL 0.0 | |
| 395.54 | 161 | | Bottom of Rock Core | | | con't 396.64 - 395.54 | |

| | | | | | | | |
|---|------------|---------------------------------|---|---|------------------------------|--|--|
| DRILLING LOG | | Project No. DACH 3-79-G-0055 | | Contractor Hassman Construction Company | | SHEET 1 OF 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P9-N-1 - Rock core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Bob Walsh | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE 11/13/80 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.18' | | | | 17 ELEVATION TOP OF HOLE 557.42' platform | | | |
| 9 TOTAL DEPTH OF HOLE 164.53' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19 Casing Record Depth 154.45' Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 151 | | | | | | | |
| 152 | | | | | | | |
| 153 | | | | | | | |
| 154 | | | | | | | |
| 403.07' | | | Bottom of Rock Socket | | | | |
| 155 | | | Dolomite, mod. hd. lt. gray with buff mottling, 1/8" chert layer at upper and lower contact, occ. vugs | | | Run #1 M.D. Start: 154.35 Start: 11:00 Stop: 11:45 M.D. Stop: 157.55 D.D. 3.2' 100% Rec. | |
| 156 | | | Dolomite, mod. hd. lt. gray to gray, frequent fractures and joints often healed with calcite, vuggy zones as shown with occ. vugs throughout. | 100 | | | |
| | | | vuggy | | | | |
| 157 | | | | | | | |
| 399.87' | | | | | | | |
| | | | broken | | 1 | | |
| 158 | | | | | | Run #2 M.D. Start: 157.55 Start: 2:22 Stop: 2:34 M.D. Stop: 160.32 D.D. 2.77 100% Rec | |
| 159 | | | | 100 | | | |
| 160 | | | | | | | |

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| DRILLING LOG | | Project No. DACH (79-C-0055 | | Contractor Massman Const. Lion Company | | SHEET 2 OF 2 SHEETS | |
|--|--|---------------------------------|--|--|--|--------------------------|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P9-M-1 - Rock Socket | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| | | | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE | |
| 7 Boring Method Rotary | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 19 Casing Record Depth Type HW | | | |
| 9 TOTAL DEPTH OF HOLE | | | | | | | |

| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|---|-------------------------|------------------------------|--|
| 397.10' | | | vugs with calcite crystals | | | Run #2 - End |
| | 161 | | | 100 | 1 | Run #3 M.D. Start: 160.32 Start: 3:00 Stop: 3:25 M.D. Stop: 164.53 D.D. 4.21 100% Rec. |
| | 162 | | | | | |
| | 163 | | vugs with quartz crystals | | | |
| | 164 | | | | | |
| 392.89' | | | Bottom of Hole | | | |

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| DRILLING LOG | | Project No. DACV 79-C-0055 | | Contractor Hassman Const. Edison Company | | SHEET 1 OF 2 SHEETS | |
|---|------------|-------------------------------|--|--|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P9-S-1 | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 11/10/80 COMPLETED 11/10/80 | | | |
| 8. DEPTH DRILLED INTO ROCK 9.92 | | | | 17. ELEVATION TOP OF HOLE 555.29' platform | | | |
| 9. TOTAL DEPTH OF HOLE 162.565' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19. Casing Record Depth 154.45' Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 151 | | | | | | | |
| 152 | | | | | | | |
| 403.14' | | | Bottom of Rock Socket | | | | |
| 153 | | | Dolomite, mod hd to hd, gray, frequent fractures, contains a few thin shale layers near bottom | | | Run #1 Start: 11:29 M.D. - start 152.175 Stop: 12:08 M.D. End run #1 156.72 D.D. 4.545' O.O' C.L. | |
| 154 | | | broken | | | | |
| 155 | | | | 100 | 1 | | |
| 156 | | | | | | | |
| 398.59 | | | Shale, dark gray, 1/16" thick broken, shaly | | | | |
| 157 | | | Dolomite, mod hd, gray to buff, with fractures and joints relatively frequent. | | | Run #2 Start: 1:13 M.D. - start 156.72' Stop: 1:30 M.D. Stop 158.95' D.D. 2.23' O.O' C.L. | |
| 158 | | | vug with Fe staining | 100 | 1 | | |
| 396.36' | | | | | | | |
| 159 | | | Dolomite, mod hd, gray with buff mottling, numerous frac. and jts. mostly healed and tight, numerous small vugs with quartz crystals, cherty, and some Fe staining. | 100 | 1 | Run #3 Cont. on page 2 | |

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| DRILLING LOG | | Project No. DACH 07-70-C-0055 | | Contractor Masman Construction Company | | Sheet 2 of 2 | |
|--|-------|----------------------------------|--|--|-------------------------|--|--|
| Norfolk Lake Bridges | | | | 10. SIZE AND TYPE HQ - Diamond | | | |
| 2. LOCATION of Boring H62-P10-N-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 164.23 EL 392.95 | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 4/13/81 COMPLETED 4/13/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.28 | | | | 17. ELEVATION TOP OF HOLE 557.18 TOP | | | |
| 9. TOTAL DEPTH OF HOLE 164.23 | | | | 18. TOTAL CORE RECOVERY FOR BORING Depth 155.45 | | | |
| | | | | 19. Casing Record Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 150 | | | | | | | |
| 151 | | | | | | | |
| 152 | | | | | | | |
| 153 | | | | | | Run #1 MD Start 153.95 MD Stop 154.05 Start 8:45 Stop 9:15 DD .1 REC .1 CL 0.0 | |
| 403.23 | 154 | | Bottom of Rock Socket | 100 | | | |
| 403.13 | 154 | | Dolomite, mod. hd. to hd. in occ. silicious zones of 1/2" to 1" thickness, mostly light gray to occ. gray, buff from 154.3 to 154.5, frequent fractures and joints often healed by calcite, dolomite, or iron, occ. vugs with quartz crystals | 100 | 1 | Run #2 MD Start 154.05 MD Stop 159.0 Start 9:33 Stop 9:59 DD 4.95 REC 4.95 CL 0.0 | |
| 155 | | | | | | | |
| 156 | | | | | | | |
| 157 | | | Broken | | | | |
| 158 | | | Vugs with quartz crystals | | | | |
| 159 | | | Vugs with quartz crystals | | | | |
| 398.18 | 159 | | Vugs with quartz crystals | 100 | | Run #3 (con't on sheet 2) | |
| 160 | | | | | | 220 | |

| DRILLING LOG | | Project No. DACH 03-79-C-0055 | | Contractor Massman Construction Company | | OF 2 SHEETS | |
|--|-------|----------------------------------|--|--|-------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H62-P10-S-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 164.56 EL393. | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 4/9/81 COMPLETED 4/10/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.33 | | | | 17. ELEVATION TOP OF HOLE 557.59 | | | |
| 9. TOTAL DEPTH OF HOLE 164.56 | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth 155.45 Type RW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 403.36 | 150 | | | | | | |
| | 151 | | | | | | |
| | 152 | | | | | | |
| | 153 | | | | | | |
| | 154 | | | | | | |
| | 155 | | Dolomite, mod. hd., gray, fractured. | | | Run #1 4/9/81 MD Start 154.23 MD Stop 157.33 Start 8:38 Stop 10:16 DD 3.1 REC 3.1 CL 0.0 | |
| | 156 | | Dolomite, mod. hd., buff with occ. 1/16" thick tan shale seams, fractures appear fresh and mechanical or along shale seams, some slight iron staining. | 100 | 1 | | |
| 400.26 | 157 | | Dolomite, hd., gray to buff, silicious with flint. | | | Run #2 MD Start 157.33 MD Stop 159.58 Start 10:35 Stop 10:56 DD 2.25 REC 2.25 CL 0.0 | |
| | 158 | | Broken Flint, hd., dk. gray-brn to blk. | | | | |
| | 159 | | Broken Broken and vuggy with calcite crystals. | 100 | 1 | | |
| 398.01 | 160 | | Dolomite, mod. hd., lt. gray to gray frequently fractured and jointed with some healing by calcite, dolomite, and iron, occ. minute vugs or druses. | | | Run #3 (see sheet two) | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Mason Construction Company | | Sheet 2 of 2 | |
|--|-------|----------------------------------|--|--|-------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H62-P10-S-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Type _____ Depth _____ HW _____ | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 394.89 | 160 | | Dolomite as above. | 98 | 1 | Run #3 MD Start 159.58 MD Stop 162.70 Start 11:10 Stop 11:45 DD 3.12 REC 3.05 CL .07 | |
| 393.03 | 163 | | | 100 | 2 | 4/9/81 4/10/81 Run #4 MD Start 162.7 MD Stop 164.56 Start 7:46 Stop 8:01 DD 1.86 REC 1.86 CL 0.0 | |
| | 164 | | Bottom of Core Hole | | | | |

| | | | | | |
|--|--|--|--|---|--|
| Project No. <u>79-C-0055</u> | | Contractor <u>Master Drilling Co.</u> | | SHEET <u>1</u> OF <u>2</u> SHEETS | |
| Location <u>Barfork Lake Bridges</u> | | 10. SIZE AND TYPE OF BIT <u>HC - Diamond</u> | | | |
| 1. LOCATION of Boring <u>62-P11-N-2-Core</u> | | 11. Boring No. | | | |
| 2. Geotechnician <u>Robert Schmoker</u> | | 12. MANUFACTURER'S DESIGNATION OF DRILL <u>Longyear HC-150</u> | | | |
| 3. HOLE NO. | | 13. Water Depth | | DISTURBED <input type="checkbox"/> UNDISTURBED <input type="checkbox"/> | |
| 4. NAME OF DRILLER <u>Bob Walsh</u> | | 14. TOTAL NUMBER CORE BOXES | | | |
| 5. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15. Depth of Bottom of Hole | | | |
| 6. Boring Method <u>Rotary</u> | | 16. DATE HOLE | | STARTED <u>3/4/81</u> COMPLETED <u>3/4/81</u> | |
| 7. DEPTH DRILLED INTO ROCK <u>10.08'</u> | | 17. ELEVATION TOP OF HOLE <u>552.18 TOP</u> | | | |
| 8. TOTAL DEPTH OF HOLE <u>157.08'</u> | | 18. TOTAL CORE RECOVERY FOR BORING <u>100</u> | | | |
| | | 19. Casing Record | | Depth <u>147.45</u> Type <u>HW</u> | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-------------|-------|--------|---|--------------------|-------------------------|--|
| 140 | | | | | | |
| 141 | | | | | | |
| 142 | | | | | | |
| 143 | | | | | | |
| 144 | | | | | | |
| 145 | | | | | | |
| 146 | | | | | | |
| 405.18' 147 | | | Bottom of Rock Socket | | | |
| 148 | | | Dolomite, mod. hd., light grey, frequent fractures and joints often healed by dolomite, calcite and iron cementation, occ. druses with dolomite crystals. | | | Run #1 MD Start 147.0' MD Stop 150.2' Start 10:30 Stop 11:05 DD 3.2' REC 3.2' CL 0.0' |
| 149 | | | Broken | 100 | 1 | |
| 150 | | | | | | |

| DRILLING LOG | | Project No. | | Contractor | | SHEET 2 | |
|--|-------|-----------------|--|---|-------------------------|--|--|
| | | Deck 194-0-0055 | | Massman Construction Co. | | OF 2 SHEETS | |
| 1. Location Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT 1/2" - Diamond | | | |
| 2. LOCATION of Boring 62-P11-n-2-Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth DISTURBED UNDISTURBED | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED COMPLETED | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth Type | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVER- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 401.98 | 50' | | Dolomite as above. | | | Run #1 | |
| | 151 | | Druses with dolomite crystals | | | Run #2 | |
| | | | | | | MD Start 150.2 | |
| | | | | | | MD Stop 155.05 | |
| | | | | | | Start 11:26 | |
| | | | | | | Stop 11:50 | |
| | | | | | | DD 4.85 | |
| | | | | | | REC 4.85 | |
| | | | | | | CL 0.0 | |
| | 152 | | Druse with dolomite crystals | | | | |
| | 153 | | | 100 | 1 | | |
| | 154 | | | | | | |
| 397.13 | 155 | | | | | Run #3 | |
| | 156 | | | 100 | | MD Start 155.05' | |
| | | | | | | MD Stop 157.08' | |
| | | | | | | Start 12:01 | |
| | | | | | | Stop 12:19 | |
| | | | | | | DD 2.03 | |
| | | | | | | REC 2.03 | |
| | | | | | | CL 0.0 | |
| 395.10' | 157 | | Bottom of Core Hole | | | | |

| DRILLING LOG | | PROJECT NO. | | DATE | | SHEET 1 | |
|-------------------------|-------|--|---|--------------------------------|-------------------------|---|--|
| LOCATION | | HOLE NO. | | DATE | | SHEET 2 | |
| Northern Lake Bridges | | 62-P11-6-1-Core | | 3/6/81 | | 3/6/81 | |
| Geotechnician | | Robert Schmoker | | Soring No. | | Longyear HC-150 | |
| HOLE NO. | | 13 | | Water Depth | | DISTURBED UNDISTURBED | |
| NAME OF DRILLER | | Bob Walsh | | TOTAL NUMBER CORE BOXES | | 1 | |
| DIRECTION OF HOLE | | X VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | Depth of Bottom of Hole | | 100 | |
| Soring Method | | Rotary | | DATE HOLE | | 3/6/81 3/6/81 | |
| DEPTH DRILLED INTO ROCK | | 10.09' | | ELEVATION TOP OF HOLE | | 552.08' Platform | |
| TOTAL DEPTH OF HOLE | | 156.44' | | TOTAL CORE RECOVERY FOR BORING | | 100 | |
| | | | | Casing Record | | Depth 147.0' | |
| | | | | | | Type HW | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 140 | | | | | | | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 143 | | | | | | | |
| 144 | | | | | | | |
| 145 | | | | | | | |
| 146 | | | | | | | |
| 405.73' | | | Bottom of Rock Socket | | | | |
| 147 | | | Dolomite, mod. hd., light grey frequent fractures and joints with Fe staining, occ. druses with dolomite crystals. | | | Run #1 Start 8:05 Stop 8:50 MD Start 146.35 MD Stop 150.35 DD 4.03' REC 3.63 CL 0.14 | |
| 148 | | | -0.14 core loss -Broken | 97 | 1 | | |
| 149 | | | | | | | |
| 150 | | | Druses with dolomite crystals | | | | |

| DRILLING LOG | | CONTRACTOR | | SHEET 2 | | |
|--|-------|---|---|-----------------|-------------------|--|
| Norfolk Lake Bridges | | Vesstrak Co. Construction Co. | | OF 2 SHEETS | | |
| 1 LOCATION of Boring 62-P11-S-1-Core | | 10 SIZE AND TYPE BIT HQ - Diamond | | | | |
| 3 Geotechnician | | 11 Boring No. | | | | |
| 4 HOLE NO. | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | | |
| 5 NAME OF DRILLER | | 13 Water Depth DISTURBED UNDISTURBED | | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 14 TOTAL NUMBER CORE BOXES | | | | |
| 7 Boring Method Rotary | | 15 Depth of Bottom of Hole | | | | |
| 8 DEPTH DRILLED INTO ROCK | | 16 DATE HOLE STARTED COMPLETED | | | | |
| 9 TOTAL DEPTH OF HOLE | | 17 ELEVATION TOP OF HOLE | | | | |
| | | 18 TOTAL CORE RECOVERY FOR BORING 2 | | | | |
| | | 19 Casing Record Depth Type | | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 1 CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
| 150 | | | | | | |
| 401.70 | | | Dolomite as above. | | | con't Run #1 |
| | | | Druse with dolomite crystals | | | Run #2 Start 10:10 Stop 10:37 MD Start 150.38' MD Stop 155.27' DD 4.89' REC 4.71' CL 0.18 |
| | 151 | | | 96 | 1 | |
| | 152 | | | | | |
| | 153 | | | | | |
| | 154 | | | | | |
| 396.81 | 155 | | 0.18 core loss | | | Run #3 Start 10:55 Stop 11:04 MD Start 155.27' MD Stop 156.44' DD 1.17' REC 1.17' CL 0.0' |
| | | | Broken | | | |
| | 156 | | | 100 | | |
| 395.64 | | | Bottom of Core Hole | | | |

| - DRILLING LOG | | Project No. DAGC 07 - C-0055 | | Contractor Massman Construction Company | | Of 2 SHEETS | |
|---|-------|---------------------------------|--|---|-------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P12-N-1-Rock | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Bob Walsh | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole Elev. 420.29' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 4/29/81 COMPLETED 4/29/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.3 | | | | 17 ELEVATION TOP OF HOLE 563.44 TOP | | | |
| 9 TOTAL DEPTH OF HOLE 143.15 | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth 134.45 Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVER- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 130 | | | | | | | |
| 131 | | | | | | | |
| 132 | | | | | | | |
| 430.59 | | | Bottom of Rock Socket | | | | |
| 133 | | | Broken | | | Run #1 | |
| | | | Shale, firm, black, 1/16" thick. | | | Start 10:00 | |
| | | | | | | Stop 10:45 | |
| | | | Dolomite, med. hd. to hd. in | | | MD Start 132.85 | |
| | | | silicious zone from 133.32' to | | | MD Stop 135.15 | |
| 134 | | | 133.78', lt. gray to gray with | 100 | 1 | DD 2.3 | |
| | | | occ. buff mottling, frequent | | | REC 2.3 | |
| | | | fractures and joints mostly | | | CL 0.0 | |
| | | | along bedding planes, occ. black | | | | |
| | | | shale seams of about 1/16" | | | | |
| | | | thickness, some vugs with | | | | |
| | | | calcite crystals. | | | | |
| 428.29 | | | | | | | |
| 135 | | | | | | Run #2 | |
| | | | | | | Start 10:58 | |
| | | | | | | Stop 11:42 | |
| | | | | | | MD Start 135.15 | |
| | | | | | | MD Stop 140.0 | |
| 136 | | | | | | DD 4.85 | |
| | | | | | | REC 4.85 | |
| | | | | | | CL 0.0 | |
| 137 | | | Shale, firm, black, 1/16" thickness | | | | |
| | | | Vugs with calcite crystals | | | | |
| | | | Shale, firm, black, 1/16" thickness | | | | |
| | | | | 100 | 1 | | |
| | | | Vugs with calcite crystals. | | | | |
| 138 | | | Vugs with calcite crystals. | | | | |
| | | | Vugs with calcite crystals. | | | | |
| | | | Vug with calcite crystals. | | | | |
| | | | Shale, firm, black, 1/16" thickness | | | | |
| 139 | | | | | | | |
| 423.44 | 140 | | | | | | |

228

Hole No.

| DRILLING LOG | | Project No. DASH 4-79-C-0055 | | Contractor Mastan Construction Co. | | SHEET 1 OF 2 SHEETS | |
|--|------------|---------------------------------|---|--|------------------------------|---|--|
| 1. LOCATION Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 62-P12-S-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth 129.45 HW | | DISTURBED UNDISTURBED | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 419.34 | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE 4/27/81 | | STARTED COMPLETED 4/27/81 | |
| 8. DEPTH DRILLED INTO ROCK 10.2 | | | | 17. ELEVATION TOP OF HOLE 557.59 TOP | | | |
| 9. TOTAL DEPTH OF HOLE 138.25 | | | | 18. TOTAL CORE RECOVERY FOR BORING 100 % | | | |
| | | | | 19. Casing Record Depth 129.45 Type HW | | | |
| ELEVATION • | DEPTH • | LEGEND • | CLASSIFICATION OF MATERIALS (Description) • | % CORE RECOV. • | BOX OR SAMPLE NO. • | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) • | |
| 120 | | | | | | | |
| 121 | | | | | | | |
| 122 | | | | | | | |
| 123 | | | | | | | |
| 124 | | | | | | | |
| 125 | | | | | | | |
| 126 | | | | | | | |
| 127 | | | | | | | |
| 429.54 | 128 | | Bottom of Rock Socket | | | | |
| | | | | | | Run #1 | |
| | | | | | | Start 12:53 | |
| | | | | | | Stop 1:10 | |
| | | | | | | MD Start 128.05 | |
| | | | | | | MD Stop 130.15 | |
| | | | | | | DD 2.1 | |
| | | | | | | REC 2.1 | |
| | | | | | | CL 0.0 | |
| 427.59 | 130 | | Flags with calcite crystals. | | | 230 | |
| | | | | | | con't on sheet 2 | |

| DRILLING LOG | | Project No. DACH 00 70-C-0065 | Contractor Massman Construction Company | of 2 sheets | | |
|--|-------|--|---|--------------------|-------------------------|---|
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | | |
| 2 LOCATION of Boring 62-P13-N-1 | | 11 Boring No. | | | | |
| 3 Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | | |
| 4 HOLE NO. | | 13 Water Depth | | | | |
| 5 NAME OF DRILLER Bob Walsh | | 14 TOTAL NUMBER CORE BOXES 1 | | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15 Depth of Bottom of Hole | | | | |
| 7 Boring Method Rotary | | 16 DATE HOLE STARTED 3/14/81 COMPLETED 3/14/81 | | | | |
| 8 DEPTH DRILLED INTO ROCK 9.99' | | 17 ELEVATION TOP OF HOLE 556.96 TOP | | | | |
| 9 TOTAL DEPTH OF HOLE 52.75' | | 18 TOTAL CORE RECOVERY FOR BORING 19 Casing Record Depth 43 Type RW | | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
| 40 | | | | | | |
| 41 | | | | | | |
| 42 | | | | | | |
| 514.20 | | | Bottom of Rock Socket | | | |
| 43 | | | Dolomite, mod. hd., light grey to dark grey in a few shaly zones with occ. 1/16" thick shale seams, massive with a few fractures mostly along bedding planes. | 100 | | Run #1 Start 12:29 Stop 12:48 MD Start 42.76 MD Stop 44.78 DD 2.02 REC 2.02 CL 0.0 |
| 44 | | | | | | |
| 512.18 | | | 0.10 Core loss Broken | | | |
| 45 | | | | | | Run #2 Start 1:45 Stop 2:00 MD Start 44.78 MD Stop 50.15 DD 5.37 REC 5.27 CL .10 |
| 46 | | | | | | |
| 47 | | | | 98 | 1 | |
| 48 | | | | | | |
| 49 | | | | | | |
| 50 | | | | | | |

| | | | | | | | |
|---|-------|---------------------------------|--|--|------------------------|--|--|
| - DRILLING LOG | | Project No. DAGC D-79-C-0055 | | Contractor Massman Construction Company | | 2 of 2 OF SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 62-P13-N-1-Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth _____ Type _____ HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 3 CORE RECOV- ERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 506.81 | 50 | | Dolomite as above. | | | Run #3 | |
| | 51 | | | 100 | 1 | Start 2:17 | |
| | | | | | | Stop 2:30 | |
| | | | | | | MD Start 50:15 | |
| | | | | | | MD Stop 52:75 | |
| | | | | | | DD 2.60 | |
| | | | | | | REC 2.60 | |
| | | | | | | CL 0.0 | |
| 504.21 | | | Bottom of Core Hole | | | | |

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| DRILLING LOG | | Project No. DACK 07 79-C-0055 | | Contractor Massman Construction Company | | page 1 of 2 of 10 sheets | |
|---|-------|----------------------------------|--|---|-------------------|---|--|
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE HQ - Diamond | | | |
| 2 LOCATION of Boring H62-P13-S-1-Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Bob Walsh | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 3/16/81 COMPLETED 3/16/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.22' | | | | 17 ELEVATION TOP OF HOLE 555.96 TOP | | | |
| 9 TOTAL DEPTH OF HOLE 52.0' | | | | 18 TOTAL CORE RECOVERY FOR BORING 1 | | | |
| | | | | 19 Casing Record Depth 43.0' Type RW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| | 40 | | | | | | |
| | 41 | | | | | | |
| 514.18 | | | Bottom of Rock Socket | | | | |
| | 42 | | Dolomite, mod. hd., light grey to dark grey in a few shaly zones with occ. 1/16" to 1/4" thick shale seams, massive with a few fractures along bedding planes. | 100 | | Run #1 Start 11:07 Stop 11:45 MB Start 41.78 MD Stop 45.14 DD 3.36 REC 3.36 CL 0.0 | |
| | 43 | | | | | | |
| | 44 | | | | | | |
| 510.82 | 45 | | | | 1 | Run #2 Start 11:55 Stop 12:26 MD Start 45.14 MD Stop 50.22 DD 5.08 REC 5.08 CL 0.0 | |
| | 46 | | | | | | |
| | 47 | | | 100 | | | |
| | 48 | | | | | | |
| | 49 | | | | | | |
| | 50 | | | | | | |

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| | | | | | | | |
|---|--|----------------------------------|--|--|--|---------------------------------|--|
| DRILLING LOG | | Project No. DACH 02-79-C-0055 | | Contractor Hassman Construction Company | | Page 2 of 2 | |
| Norfolk Lake Bridges | | | | 10 SIZE AND TYPE BIT HQ - Diamond | | | |
| LOCATION of Boring 101-P1-West-Rock Core | | | | Boring No. | | | |
| Geotechnician Robert Schmoker | | | | MANUFACTURER'S DESIGNATION OF DRILL LongyearHC-150 | | | |
| HOLE NO. | | | | 13 Water Depth | | | |
| NAME OF DRILLER Bob Walsh | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| | | | | 16 DATE HOLE | | STARTED 8/7/81 COMPLETED 8/7/81 | |
| Boring Method Rotary | | | | 17 ELEVATION TOP OF HOLE 559.33 TOP | | | |
| DEPTH DRILLED INTO ROCK 10.23' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100% | | | |
| TOTAL DEPTH OF HOLE 72.48' | | | | 19 Casing Record Depth 63 Type RW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|---|--------------------|-------------------------|--|
| a | b | c | d | e | f | g |
| | 60 | | | | | |
| | 61 | | | | | |
| | 62 | | | | | |
| 497.08 | | | Bottom of Rock Socket | | | |
| | 63 | | Broken | | | Run #1 |
| | | | Vugs with calcite crystals. | | | Start 9:26 |
| | | | | | | Stop 9:46 |
| | | | | | | MD Start 62.25' |
| | | | | | | MD Stop 64.9' |
| | | | | | | DD 2.65' |
| | | | | 100 | 1 | REC 2.65' |
| | | | Shale, mod. hd., brown. | | | CL 0.0 |
| | 64 | | Vug with calcite crystals | | | |
| | | | Dolomite, mod. hd. to hd., gray, frequent fractures and joints with some iron staining, occ. vugs, trace of shale | | | Run #2 |
| 494.43 | | | | | | Start 10:00 |
| | 65 | | | | | Stop 10:21 |
| | | | | | | MD Start 64.9' |
| | | | | | | MD Stop 70.0' |
| | | | | | | DD 5.1' |
| | 66 | | | | | REC 5.1' |
| | | | Vugs with calcite crystals. | | | CL 0.0' |
| | 67 | | | | | |
| | | | Broken | | | |
| | 68 | | | | | |
| | | | | 100 | 1 | |
| | 69 | | | | | |
| | | | Broken | | | |
| 489.33 | 70 | | | | | |

| | | | | |
|---|--|--|--|-------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS |
| 1 PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | |
| 2 LOCATION of Boring 101-pl-West-Rock Core | | 11 Boring No. | | |
| 3 Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | |
| 4 HOLE NO. | | 13 Water Depth | | |
| 5. NAME OF DRILLER | | 14 TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15 Depth of Bottom of Hole | | |
| 7 Boring Method <u>Rotary</u> | | 16 DATE HOLE _____ STARTED _____ COMPLETED _____ | | |
| 8 DEPTH DRILLED INTO ROCK | | 17 ELEVATION TOP OF HOLE | | |
| 9 TOTAL DEPTH OF HOLE | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| | | 19. Casing Record Depth _____ Type <u>Rw</u> | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVER- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|--|---------------------------|-------------------------|---|
| 489.33 | 70 | | Dolomite, as above. | | | Run #3 Start 10:40 Stop 10:58 MD Start 70.0' MD Stop 72.48' DD 2.48' REC 2.48' CL 0.0' |
| | 71 | | | 100 | 1 | |
| | 72 | | | | | |
| 486.85 | | | Bottom of Rock Core | | | |

| | | | | | |
|--|-------|--|--|--|-------------------------|
| 1. DRILLING LOG | | Project No. DACH 03-79-C-0055 | | Contractor Massman Construction Company | |
| 2. LOCATION of Boring Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | 11. Boring No. | |
| 3. Geotechnician Robert Schmoker | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | 13. Water Depth | |
| 4. HOLE NO. | | 14. TOTAL NUMBER CORE BOXES | | 15. Depth of Bottom of Hole | |
| 5. NAME OF DRILLER Bob Walsh | | 16. DATE 8/6/81 | | 17. ELEVATION TOP OF HOLE 555.98 TOP | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 18. Boring Method Rotary | | 19. Cast Record Depth 60' | |
| 7. Boring Method | | 8. DEPTH DRILLED INTO ROCK 18.2' | | 9. TOTAL DEPTH OF HOLE 77.4' | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | CORE NO. | BOX OR SAMPLE NO. |
| 50 | | | | | |
| 51 | | | | | |
| 52 | | | | | |
| 53 | | | | | |
| 54 | | | | | |
| 55 | | | | | |
| 56 | | | | | |
| 57 | | | | | |
| 58 | | | | | |
| 59 | | | | | |
| 596.78 | | | Bottom of Rock Socket | | |
| | | | Dolomite, as described below. | 100 | 1 |
| | | | Broken | | |
| Run #1 See Sheet #2 | | | | | 238 |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Masamen Construction Company | | of 3 SHEETS | |
|--|-------|----------------------------------|--|--|-------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101-P1-East-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL DEPTH OF CORE Type _____ | | | |
| | | | | 19 Casing Record Depth _____ Type _____ | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 60 | | | Broken Shale, mod hd., tan. | | | Run #1 Start 9:40 Stop 10:25 MD Start 59.2' MD Stop 64.05' DD 4.85' REC 4.85' CL 0.0' | |
| | | | Dolomite, as described below. | | | | |
| 61 | | | Vugs with Fe coating. | | | | |
| | | | Chert, hd., gray. | 100 | 1 | | |
| 62 | | | | | | | |
| | | | Dolomite, mod. hd. to hd., gray to buff-gray, frequent fractures and joints sometimes with calcite or iron healing, occ. vugs, occ. slight to mod. reaction to HCl indicating transition to limestone, trace of shale. | | | | |
| 63 | | | | | | | |
| 491.93' | 64 | | | | | Run #2 Start 10:43 Stop 10:53 MD Start 64.05' MD Stop 69.15' D.D. 5.1' REC 4.8' CL .3' | |
| | | | Broken | | | | |
| 65 | | | 0.3 C. L. | | | | |
| | | | Chert, hd., gray. | 94 | 1 | | |
| 66 | | | | | | | |
| | | | | | | | |
| 67 | | | | | | | |
| | | | | | | | |
| 68 | | | | | | | |
| | | | | | | | |
| 69 | | | | | | Run #3 See sheet #3 | |
| 486.83' | | | | | | | |
| | | | | | | | |
| 70 | | | Vug with calcite crystals. | 100 | 1 | 239 | |

| | | | | | | | |
|--|--|--|--|--|--|-------------|--|
| 1 DRILLING LOG | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | of 3 sheets | |
| 2 LOCATION of Boring Norfolk Lake Bridges | | 10 SIZE AND TYPE BQ - Diamond | | 11 Boring No. | | | |
| 3 Geotechnician | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | 13 Water Depth | | | |
| 4 HOLE NO. | | 14 TOTAL NUMBER CORE BOXES | | 15 Depth of Bottom of Hole | | | |
| 5 NAME OF DRILLER | | 16 DATE HOLE | | STARTED | | COMPLETED | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 17 ELEVATION TOP OF HOLE | | 18 TOTAL CORE RECOVERY | | | |
| 7 Boring Method Rotary | | 19 Casing Record | | Depth | | Type | |
| 8 DEPTH DRILLED INTO ROCK | | 19 Casing Record | | Depth | | Type | |
| 9 TOTAL DEPTH OF HOLE | | 19 Casing Record | | Depth | | Type | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|--|--------------------|-------------------------|---|
| | 70 | | Vugs with calcite crystals. | | | Run #3 Start 12:26 Stop 12:49 MD Start 69.15' MD Stop 74.2' DD 5.05' REC 5.05' CL 0.0' |
| | 71 | | Dolomite, as above. | | | |
| | 72 | | Shale, mod. hd., brown. | 100 | 1 | |
| | 72 | | Vug with calcite crystals. | | | |
| | 73 | | Broken with calcite crystals. | | | |
| | 74 | | | | | |
| 481.78 | | | | | | |
| | 75 | | | 100 | 1 | Run #4 Start 1:13 Stop 1:31 MD Start 74.2' MD Stop 77.4' DD 3.2' REC 3.2' CL 0.0' |
| | 76 | | | | | |
| | 77 | | | | | |
| 478.58 | | | Bottom of Rock Core | | | |
| | 78 | | | | | |
| | 79 | | | | | |

| DRILLING LOG | | Project No. DACH 03-78-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|--|------------|----------------------------------|---|--|------------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT H2 - Diamond | | | |
| 2 LOCATION of Boring H101-P2-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | MANUFACTURER'S DESIGNATION OF DRILL Lungyear HC 150 | | | |
| 4 HOLE NO. | | | | 12 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 13 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 14 Depth of Bottom of Hole 401.44' | | | |
| 7 Boring Method Rotary | | | | 15 DATE HOLE STARTED 9/17/81 COMPLETED 9/17/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.16' | | | | 16 ELEVATION TOP OF HOLE 564.44' TOP | | | |
| 9 TOTAL DEPTH OF HOLE 163.0' | | | | 17 TOTAL CORE RECOVERY FOR BORING 100% | | | |
| | | | | 18 Casing Record Depth 153' Type RW | | | |
| ELEVATION • | DEPTH • | LEGEND • | CLASSIFICATION OF MATERIALS (Description) • | 1 CORE RECOV- ERY • | BOX OR SAMPLE NO. • | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) • | |
| 411.6' | 150 | | Bottom of Rock Socket | | | | |
| | 151 | | | | | | |
| | 152 | | | | | | |
| | 153 | | Dolomite, Mod. hd. to hd., gray, Frequent fractures and joints, occ. iron staining on fracture planes. | 100 | 1 | Run #1 Start 11:05 Stop 11:19 MD Start 152.84' MD Stop 157.7' DD 4.86' REC 4.86' CL 0.0 " | |
| | 154 | | | | | | |
| | 155 | | | | | | |
| | 156 | | | | | | |
| | 157 | | | | | | |
| 406.74 | 158 | | | | | | |
| | 159 | | | 100 | 1 | Run #2 See sheet #2 | |
| | 160 | | | | | | |

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| DRILLING LOG | | | Project No. DACH 03-79-C-0055 | | Contractor Hassman Construction Company | | SHEET 2 OF 2 SHEETS | |
|--|------------|-------------|--|------------------------------|--|---|------------------------|--|
| 1 PROJECT Norfolk Lake Bridges | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | | | |
| 2 LOCATION of Boring H101-P2-W-Rock Core | | | 11 Boring No. | | | | | |
| 3 Geotechnician | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | | | |
| 4 HOLE NO | | | 13 Water Depth | | | | | |
| 5 NAME OF DRILLER | | | 14 TOTAL NUMBER CORE BOXES | | | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | 15 Depth of Bottom of Hole | | | | | |
| 7 Boring Method Rotary | | | 16 DATE HOLE | | | STARTED _____ COMPLETED _____ | | |
| 8 DEPTH DRILLED INTO ROCK | | | 17 ELEVATION TOP OF HOLE | | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| 9 TOTAL DEPTH OF HOLE | | | 19 Casing Record | | | Depth _____ Type _____ | | |
| ELEVATION * | DEPTH * | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | 1 CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | | |
| | 160 | | Dolomite, as above. | | | Run #2 Start 11:44 Stop 11:58 MD Start 157.7' MD Stop 163.0' DD 5.3' REC 5.3' CL 0.0 | | |
| | 161 | | | 100 | 1 | | | |
| | 162 | | | | | | | |
| 401.44 | 163 | | Bottom of Rock Core | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|---|------------|----------------------------------|--|---|------------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring H101-P2-E-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longvear HC 150 | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gillev | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole 401.14' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 9/18/81 COMPLETED 9/18/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.46' | | | | 17 ELEVATION TOP OF HOLE 562.66 TOP | | | |
| 9 TOTAL DEPTH OF HOLE 161.52' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100% | | | |
| | | | | 19 Casing Record Depth 152.0' Type RW | | | |
| ELEVATION • | DEPTH • | LEGEND • | CLASSIFICATION OF MATERIALS (Description) • | % CORE RECOVERY • | BOX OR SAMPLE NO. • | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) • | |
| 411.6' | 151 | | Bottom of Rock Socket | | | | |
| | 152 | | Broken Dolomite, Mod. hd. to hd., gray to buff, frequent fractures and joints, some iron stains on fracture planes | 100 | 1 | Run #1 Start 10:25 Stop 10:36 MD Start 151.06' MD Stop 154.86' DD 3.8' REC 3.8' CL 0.0' | |
| 407.8' | 155 | | | | | Run #2 Start 10:51 Stop 11:04 MD Start 154.86' MD Stop 159.6' DD 4.74' REC 4.74' CL 0.0' | |
| 403.6' | 159 | | | 100 | 1 | | |
| 160 | | | | | | Run #3 See sheet 2 | |

| DRILLING LOG | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|--|------------|----------------------------------|---|--|------------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring H101-P2=E-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING 3 | | | |
| | | | | 19 Casing Record Depth _____ Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | 1 CORE RELOV. ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 160 | | Dolomite, as above. | 100 | 1 | Run #3 Start 11:17 Stop 11:23 MD Start 159.6' MD Stop 161.52' DD 1.92' REC 1.92' CL 0.0 | |
| 401.14' | | | Bottom of Rock Core | | | | |

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AD-A130 553

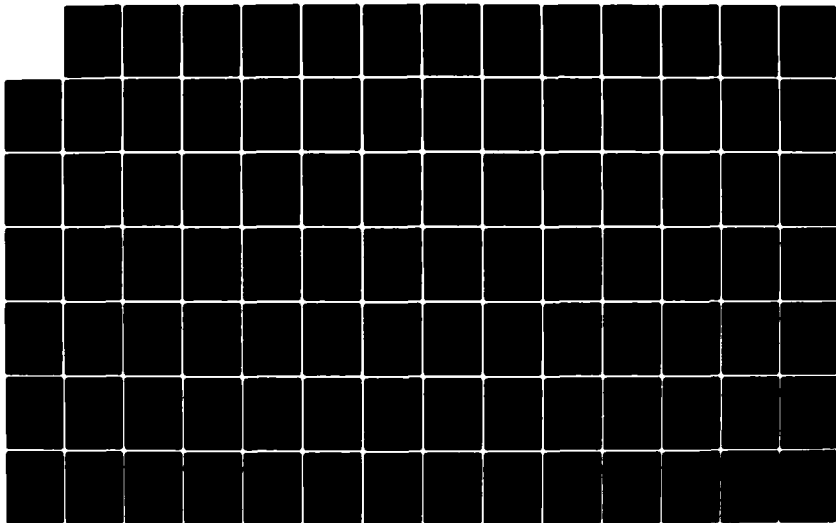
NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS
WHITE RIVER AND TRIBU... (U) ARMY ENGINEER DISTRICT
LITTLE ROCK ARK R L CRUTCHFIELD JUN 83

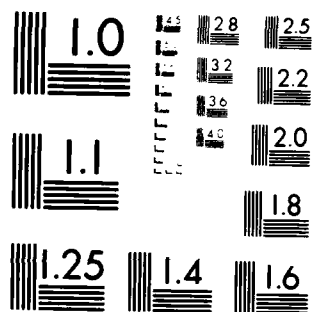
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NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

| DRILLING LOG | | Project No. DACH 11-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 of 2 SMLS | |
|--|------------|----------------------------------|---|--|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 101-P3-West-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Test Pit | | | | 16. DATE HOLE STARTED 7/28/81 COMPLETED 7/28/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.06' | | | | 17. ELEVATION TOP OF HOLE 559.5 TOP | | | |
| 9. TOTAL DEPTH OF HOLE 185.0' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100% | | | |
| | | | | 19. Casing Record Depth 186.0' Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 170 | | | | | | |
| | 171 | | | | | | |
| | 172 | | | | | | |
| | 173 | | | | | | |
| | 174 | | | | | | |
| 384.46' | 175 | | Bottom of Rock Socket | | | | |
| | 176 | | Broken Dolomitic Limestone, hd., gray to pinkish-gray, frequent fractures and joints with some healing of calcite occ. chert seams, slight to mod. reaction to HCl. | 100 | 1 | Run #1 Start 4:23 Stop 4:45 MD Start 174.94' MD Stop 176.5' DD 1.56' REC 1.56' CL 0.0' | |
| 382.90' | | | Chert, hd, gray-brown | | | Run #2 MD Start 176.5' MD Stop 179.65' DD 3.15' REC 3.15' CL 0.0 Start 5:44 Stop 6:03 | |
| | 177 | | Chert, hd, gray-brown | 100 | 1 | | |
| | 178 | | | | | | |
| | 179 | | | | | | |
| 379.75' | | | | | | | |
| | 180 | | | | | Run #3 See sheet #2 | |

245

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | of 2 | |
|--|--------------|----------------------------------|---|--|------------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101-P3-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth _____ Type HW | | | |
| ELEVATION a | DEPTH 18Q | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 181 | | Dolomitic Limestone as above. | | | Run #3 Start 6:15 Stop 6:42 MD Start 179.65' MD Stop 184.5' DD 4.85' REC 4.85' CL 0.0' | |
| | 182 | | -Broken | 100 | 1 | | |
| | 183 | | | | | | |
| | 184 | | | | | | |
| 374.9' | | | | | | | |
| 374.4' | | | Bottom of Rock Core | 100 | 1 | Run #4 Start 7:50 Stop 7:53 MD Start 184.5' MD Stop 185.0' DD .5' REC .5' CL 0.0' | |
| | 185 | | | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|--|--|-------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Masman Construction Company | | of 2 sheets | |
| 1. LOCATION Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF PIT HQ - Diamond | | | |
| 2. LOCATION OF Boring H101-P3-East-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth 548.3' | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Location of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 7/25/81 COMPLETED 7/25/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.14' | | | | 17. ELEVATION TOP OF HOLE 561.48 TOP | | | |
| 9. TOTAL DEPTH OF HOLE 187.12' | | | | 18. Casing Record Type HW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVER- | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|---|--------------------|-------------------------|--|
| 170 | | | | | | |
| 171 | | | | | | |
| 172 | | | | | | |
| 173 | | | | | | |
| 174 | | | | | | |
| 175 | | | | | | |
| 176 | | | | | | |
| 384.5' | 177 | | Bottom of Rock Socket | | | Run #3 Start 3:06 Stop 3:26 MD Start 179.0' MD Stop 179.26' DD .26' REC .26' CL 0.0' |
| 384.37' | | | Dolomite Limestone (described below) | 100 | | Run #1 |
| 178 | | | Broken Shale, dark gray, mod. hd. | 100 | 1 | Run #2 Start 12:48 Stop 1:40 MD Start 177.11' MD Stop 179.0' DD 1.89' REC 1.89' CL 0.0' |
| 382.48' | 179 | | Dolomitic Limestone, mod hd to hd, gray to pinkish gray, frequent fractures and joints, some vugs and fractures containing calcite crystals, slight to mod-strong reaction to HCl | 100 | | Run #3 See above |
| 382.22' | | | | | | Run #4 See sheet #2 |
| 180 | | | | 100 | | |

| | | | | | | | |
|---|--|----------------------------------|--|---|--|-------------|--|
| DRILLING LOG | | Project No. DACW 01-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT RQ - Diamond | | | |
| 2. LOCATION of Boring 101-P3-East Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth Type HW | | | |

| ELEVATION • | DEPTH 180 | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY • | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|--------------|--|---|-------------------------|------------------------------|---|
| | 180 | | Dolomitic Limestone as above. | | | Run #4 Start 3:40 Stop 4:10 MD Start 179.26' MD Stop 184.3' DD 5.04' REC 5.04' CL 0.0' |
| | 181 | | | 100 | 1 | |
| | 182 | | | | | |
| | 183 | Broken | | | | |
| 377.18 | 184 | | | | | |
| | 185 | Broken Vug with calcite crystals Fractures with calcite crystals | | 100 | 1 | Run #5 Start 4:23 Stop 4:46 MD Start 184.3' MD Stop 187.12' DD 2.82' REC 2.82' CL 0.0' |
| | 186 | | | | | |
| | 187 | Broken | | | | |
| 374.36 | | | Bottom of Rock Core | | | |

| DRILLING LOG | | Project No. DACW-01-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
|--|------------|----------------------------------|---|--|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H101-P4-West-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Mike Gilley | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| | | | | 16. DATE HOLE | | COMPLETED | |
| | | | | 9/1/81 | | 9/1/81 | |
| 7. Boring Method Rotary | | | | 17. ELEVATION TOP OF HOLE 563.0' TO Platform | | | |
| 8. DEPTH DRILLED INTO ROCK 10.65' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100% | | | |
| 9. TOTAL DEPTH OF HOLE 173.95' | | | | 19. Casing Record Depth 164 Type HW | | | |
| ELEVATION " | DEPTH ' | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 160 | | | | | | | |
| 161 | | | | | | | |
| 162 | | | | | | | |
| 163 | | | | | | | |
| 399.7' | | | Bottom of Rock Socket | | | | |
| | | | Broken | | | Run #1 Start 11:24 Stop 11:53 MD Start 163.3' MD Stop 167.7' DD 4.4' REC 4.4' CL 0.0 | |
| 164 | | | Dolomite, mod. hd. to hd., gray to gray-buff, frequent fractures and joints with occasional iron stains. | 100 | 1 | | |
| 165 | | | | | | | |
| 166 | | | | | | | |
| 167 | | | | | | | |
| 395.3' | | | | | | | |
| 168 | | | | | | Run #2 Start 12:07 Stop 12:22 MD Start 167.7' MD Stop 172.77' DD 5.07' REC 5.07' CL 0.0 | |
| 169 | | | Broken | 100 | 1 | | |
| 170 | | | | | | | |

| DRILLING LOG | | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
|---|-------|--------|---|--|--|-------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | 11. Boring No. | | | |
| 2. LOCATION of Boring H101-P4-West-Rock Core | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | | | |
| 3. Geotechnician | | | 13. Water Depth | | | | | |
| 4. HOLE NO. | | | 14. TOTAL NUMBER CORE BOXES | | | | | |
| 5. NAME OF DRILLER | | | 15. Depth of Bottom of Hole | | | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | 16. DATE HOLE | | STARTED | | COMPLETED | |
| 7. Boring Method Rotary | | | 17. ELEVATION TOP OF HOLE | | | | | |
| 8. DEPTH DRILLED INTO ROCK | | | 18. TOTAL CORE RECOVERY FOR BORING | | | | | |
| 9. TOTAL DEPTH OF HOLE | | | 19. Casing Record | | Depth Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | | % CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| | 170 | | Dolomite, as above. | | | | Run #2 con't (See sheet #1) | |
| | 171 | | | | 100 | 1 | | |
| | 172 | | | | | | | |
| 390.23' | | | | | | | | |
| | 173 | | | | 100 | 1 | Run #3 Start 12:30 Stop 12:35 MD Start 172.77' MD Stop 173.95' DD 1.18 REC 1.18 CL 0.0 | |
| 389.05 | | | Bottom of Rock Core | | | | | |
| | | | | | | | | |

| | | | | | | | |
|--|--|----------------------------------|--|--|--|-------------|--|
| DRILLING LOG | | Project No. DACV-03-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H101-P4-East-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Mike Gilley | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE 8/31/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.22' | | | | 17. ELEVATION TOP OF HOLE 560.7' TO Platform | | | |
| 9. TOTAL DEPTH OF HOLE 171.33' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100% | | | |
| | | | | 19. Casing Record Depth 162' Type RW | | | |

| ELEVATION • | DEPTH c | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|--|------------------------------|------------------------------|---|
| | 160 | | | | | |
| | | | | | | |
| | | | | | | |
| 399.6' | 161 | | Bottom of Rock Socket | | | |
| | | | Broken | | | |
| | | | | 100 | | Run #1 Start 8:55 Stop 9:10 MD Start 161.1' MD Stop 161.97' DD .87' REC .87' CL 0.0 |
| 398.73 | 162 | | Dolomite, mod. hd. to hd., gray to buff, frequent fractures and joints often iron stained, siliceous and quite hd. from 168.81 to 170.25. | | | Run #2 Start 9:31 Stop 9:41 MD Start 161.97' MD Stop 162.6' DD & REC .63' CL 0.0 |
| 398.1 | | | | 100 | 1 | Run #3 Start 11:00 Stop 11:15 MD Start 162.6' MD Stop 163.15' DD & REC .55' CL 0.0 |
| 397.55 | 163 | | Broken | 100 | | Run #4 Start 11:45 Stop 2:15 MD Start 163.15' MD Stop 168.38' DD 5.23' REC 5.23' CL 0.0 |
| | 164 | | | | | |
| | | | | | | |
| | | | | | | |
| | 165 | | | | | |
| | | | | 100 | 1 | |
| | 166 | | | | | |
| | | | | | | |
| | | | | | | |
| | 167 | | | | | |
| | | | | | | |
| | | | | | | |
| | 168 | | Broken | | | |
| 392.32' | | | | | | Run #5 See sheet #2 |
| | 169 | | | 100 | 1 | |
| | | | | | | |
| | 170 | | | | | |

| DRILLING LOG | | Project No. DACW 93-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
|---|------------|----------------------------------|---|---|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 101-P4-East-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth _____ Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 170' | | | Dolomite as above. | 100 | 1 | Run #5 Start 2:30 Stop 2:40 MD Start 168.38' MD Stop 171.33' DD 2.95' REC 2.95' CL 0.0 | |
| 171' | | | Moderately weathered. | | | | |
| 389.38' | | | Bottom of Rock Core | | | | |
| <div style="position: absolute; top: 10%; left: 10%; font-family: cursive;"> 399.4 389.4 10.2 </div> | | | | | | | |

| DRILLING LOG | | Project No. DACW 07-79-C-0055 | | Contractor Massman Construction Company | | OF 3 SHEETS | |
|--|-------|----------------------------------|---|--|-------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 101-P5-W-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | |
| 4. HOLE NO. | | | | 13. Water Depth Level 548.80' | | | |
| 5. NAME OF DRILLER Bob Walsh | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE 6/15/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 16.51' | | | | 17. ELEVATION TOP OF HOLE 561.79' TOP | | | |
| 9. TOTAL DEPTH OF HOLE 182.25' | | | | 18. TOTAL CORE RECOVERY FOR BORING 51% | | | |
| 19. Casing Record Depth 183' Type RW | | | | | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 160 | | | | | | | |
| 161 | | | | | | | |
| 162 | | | | | | | |
| 163 | | | | | | | |
| 164 | | | | | | | |
| 165 | | | | | | | |
| 396.05' | | | Bottom of Rock Socket | | | | |
| 166 | | | Broken Dolomite, Mod. hd., gray- buff, frequent joints and fractures with Fe stains. | | | Run #1 Start 12:15 Stop 12:45 MD Start 165.74' MD Stop 170.02' DD 4.28' REC 2.25' CL 2.03' 396.05' - 391.77' | |
| 167 | | | | | | | |
| 168 | | | Broken | 53 | 1 | | |
| 169 | | | 2.03 C.L. | | | | |
| 391.75 | 170 | | | | | | |

| | | | | | | | |
|--|--------------|---|--|--|--------------------------|--|--|
| DRILLING LOG | | Project No. DACW 02-79-C-0055 | | Contractor Hassman Construction Company | | of 3 SHEETS | |
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 101-P5-W-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth _____ Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 391.75 | 170 | | | | | Run #2 | |
| 391.77 | | | | | | Start 1:10 | |
| | | | | | | Stop 1:40 | |
| | | | | | | MD Start 170.02' | |
| | | | | | | MD Stop 175.20' | |
| | | | | | | DD 5.18' | |
| | | | | | | REC 2.15' | |
| | | | | | | CL 3.03' | |
| | 171 | | | | | | |
| | 172 | | | 42 | 1 | | |
| | 173 | | | | | | |
| | 174 | | 3.21' C.L. (Red clay on bottom of core at 171.99.) | | | | |
| | 175 | | | | | | |
| 386.55 | | | | | | Run #3 | |
| | | | Dolomite, mod soft but firm, weathered, silty, extremely fractured with Fe stains. | | | Start 12:30 | |
| | | | | | | Stop 12:40 | |
| | | | | | | MD Start 175.20' | |
| | | | | | | MD Stop 179.56' | |
| | | | | | | DD 4.36' | |
| | | | | | | REC 2.36' | |
| | | | | | | CL 2.0 | |
| | 176 | | Broken | | | | |
| | 177 | | | 54 | 1 | | |
| | 178 | | | | | | |
| | | | 2. ' C.L. | | | | |
| | 179 | | | | | | |
| 382.19 | | | | | | Run #4 (See sheet 3) | |
| 381.75 | 180 | | Broken | | | | |

254

[illegible]

| D-LOG LOG | | PROJECT NO. | | Mason Construction Company | | |
|---|-------|--|--|-----------------------------------|------------------|--|
| DACH 03-79-C-0055 | | 10 SIZE AND TYPE | | 11 Boring No. | | |
| Norfolk Lake Bridge | | 12 MANUFACTURER'S DESIGNATION OF CHILL | | 13 Water Depth | | |
| LOCATION of Boring 101-P6-W-2-Rock Core | | Longyear HC 150 | | 14 TOTAL NUMBER CORE BOXES 1 | | |
| 1 Geotechnician Robert Schmoker | | 15 Depth of Bottom of Hole | | 16 DATE HOLE | | |
| 4 HOLE NO | | 17 ELEVATION TOP OF HOLE 561.79 TOP | | 18 TOTAL CORE RECOVERY FOR BORING | | |
| 5 NAME OF DRILLER Bob Walsh | | 19 Casing Record | | 20 | | |
| 6 DIRECTION OF HOLE | | Type | | 21 | | |
| 7 Boring Method Rotary | | Depth | | 22 | | |
| 8 DEPTH DRILLED INTO ROCK 16.6' | | Type | | 23 | | |
| 9 TOTAL DEPTH OF HOLE 182.65' | | Type | | 24 | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
| 395.7' | 160 | | | | | |
| | 161 | | | | | |
| | 162 | | | | | |
| | 163 | | | | | |
| | 164 | | | | | |
| | 165 | | | | | |
| | 166 | | Bottom of Rock Socket | | | |
| | 167 | | Broken | 100 | 1 | Run #1 Start 4:30 Stop 5:00 MD Start 166.05' MD Stop 168.30' DD 2.25' REC 2.25' CL 0.0' |
| | 168 | | Broken | | | |
| 393.49' | 169 | | Dolomite, mod. hd., gray-buff, frequent fractures and joints with Fe stains silty in places. | 100 | 1 | Run #2 Start 7:44 Stop 7:54 MD Start 168.3' MD Stop 169.65' DD 1.35' REC 1.35' CL 0.0' |
| 392.14 | 170 | | Broken | | | Run #3 see sheet 2 |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | of 3 SHEETS | |
|--|-------|----------------------------------|--|--|-------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridge | | | | 10 SIZE AND TYPE BIT RQ - Diamond | | | |
| 2 LOCATION of Boring 101-P5-W-2-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth _____ Type _____ | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 170 | | | Dolomite, as above. Broken | | | Run #3 Start 8:14 Stop 8:20 MD Start 169.65' MD Stop 174.42' DD 4.77' REC .77' CL 4.0' (silt bed - 391.37' -387.37') | |
| 171 | | | | 16 | 1 | | |
| 172 | | | 4.0' C. L. | | | | |
| 173 | | | | | | | |
| 174 | | | | | | | |
| 387.27 | | | Broken | | | | |
| 175 | | | | | | Run #4 Start 8:41 Stop 8:57 MD Start 174.42' MD Stop 179.69' DD 5.27' REC 5.27' CL 0.0 | |
| 176 | | | | | | | |
| 177 | | | | 100 | 1 | | |
| 178 | | | | | | | |
| 179 | | | | | | | |
| 382.10 | | | Broken | | | | |
| 180 | | | | | | | |

257

Run #5 see sheet 3

| DRILLING LOG | | Project No. DACH 03-79-C-0055 | | CONTRACTOR Hassman Construction Company | | OF 3 SHEETS | |
|---|------------|---|---|--|------------------------------|---|--|
| 1. HOLE NO. Norfolk Lake Bridge | | 10. SIZE AND TYPE HIT HQ - Diamond | | 11. Boring No. | | | |
| 2. LOCATION of Boring 101-P5-W-2-Rock Core | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | 13. Water Depth | | | |
| 3. Geotechnician | | 14. TOTAL NUMBER CORE BOXES | | 15. Depth of Bottom of Hole | | | |
| 4. HOLE NO. | | 16. DATE HOLE | | 17. ELEVATION TOP OF HOLE | | | |
| 5. NAME OF DRILLER | | 18. TOTAL CORE RECOVERY FOR BORING | | 19. Casing Record | | Depth Type | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 19. Casing Record | | Type | | H _W | |
| 7. Boring Method Rotary | | 19. Casing Record | | Type | | H _W | |
| 8. DEPTH DRILLED INTO ROCK | | 19. Casing Record | | Type | | H _W | |
| 9. TOTAL DEPTH OF HOLE | | 19. Casing Record | | Type | | H _W | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 180 | | | Dolomite, as above. | | | Run #5 | |
| | | | Broken | | | Start 9:13 | |
| | | | | | | Stop 9:27 | |
| | | | | | | MD Start 179.69' | |
| | | | | | | MD Stop 182.65' | |
| | | | | | | DD 2.96' | |
| | | | | | | REC .66' | |
| | | | | | | CL 2.3' | |
| | | | | | | (381.44' - 379.14') | |
| | | | | | | 2.3' clay filled | |
| | | | | | | cavern) | |
| | | | | | | (Drill water turned red | |
| | | | | | | in last 2.3' of hole.) | |
| 379.14' | | | Bottom of Hole | | | | |

| DRILLING LOG | | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
|--|-------|--------|--|-----------------|--|--|-----------------------------------|--|
| 1. LOCATION of Boring Norfolk Lake Bridges | | | 2. Geotechnician Robert Schmoker | | 3. HOLE NO. | | 4. NAME OF DRILLER Bob Walsh | |
| 5. Boring Method Rotary | | | 6. DEPTH DRILLED INTO ROCK 10.13' | | 7. TOTAL DEPTH OF HOLE 175.14' | | 8. DATE HOLE 6/19/81 | |
| 9. ELEVATION TOP OF HOLE 560.76 TOP | | | 10. TOTAL CORE RECOVERY FOR BORING | | 11. Casing Record Depth 167.0' | | 12. TYPE HW | |
| 13. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150 | | | 14. WATER DEPTH | | 15. TOTAL NUMBER CORE BOXES | | 16. DEPTH OF BOTTOM OF HOLE | |
| 17. SIZE AND TYPE BIT RQ - Diamond | | | 18. Boring No. | | 19. STARTED 6/19/81 | | 20. COMPLETED 6/19/81 | |
| 21. VERTICAL <input checked="" type="checkbox"/> INCLINED <input type="checkbox"/> DEC. FROM VERT. | | | 22. ELEVATION TOP OF HOLE 560.76 TOP | | 23. TOTAL CORE RECOVERY FOR BORING | | 24. Casing Record Depth 167.0' | |
| 25. TYPE HW | | | 26. TYPE HW | | 27. TYPE HW | | 28. TYPE HW | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | | |
| 160 | | | | | | | | |
| 161 | | | | | | | | |
| 162 | | | | | | | | |
| 163 | | | | | | | | |
| 164 | | | | | | | | |
| 395.76 | 165 | | Rock Bottom of Socket | | | | | |
| 166 | | | Broken Dolomite, Mod. Hd., buff to gray-buff, frequent fractures and joints with Fe staining. | 100 | 1 | Run #1 Start 3:00 Stop 3:37 MD Start 165.01 MD Stop 169.1 DD 4.09 REC 4.09 CL 0.0 | | |
| 167 | | | | | | | | |
| 168 | | | | | | | | |
| 391.66 | 169 | | Broken | | | Run #2 See sheet #2 | | |
| 170 | | | | | | | | |

| DRILLING LOG | | Project No. DACH 03-79-C-0055 | | Contractor Massman Construction Company | | of 2 SHEETS | |
|---|--------------|----------------------------------|---|---|------------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 101-P5-E-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth _____ Type _____ HW | | | |
| ELEVATION • | DEPTH 170 | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | 2. CORE RECOVERY • | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | | | Dolomite, as above. | | | Run #2 Start 3:56 Stop 4:27 MD Start 169.1 MD Stop 173.93 DD 4.83' REC 4.83' CL 0.0 | |
| | | | Broken | | | | |
| | 171 | | | | | | |
| | | | Broken | | | | |
| | 172 | | | 100 | 1 | | |
| | | | | | | | |
| | 173 | | | | | | |
| 386.83 | | | | | | | |
| | 174 | | Chert, gray-green | | | Run #3 Start 4:35 Stop 4:50 MD Start 173.93' MD Stop 175.14' DD 1.21 REC 1.0 CL .21 | |
| | | | Vug, lined with hematite-limonite | 83 | 1 | | |
| | | | 0.21' C.L. | | | | |
| 385.62' | 175 | | Bottom of Rock Core | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Hassman Construction Company | | SHEET 1 OF 2 SHEETS | |
|---|------------|----------------------------------|---|---|------------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT RQ - Diamond | | | |
| 2 LOCATION of Boring #101-P6-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole 408.6' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 10/13/81 COMPLETED 10/13/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.41' | | | | 17 ELEVATION TOP OF HOLE 561.8 TO Platform | | | |
| 9 TOTAL DEPTH OF HOLE 153.2' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100% | | | |
| | | | | 19 Casing Record Depth 143.4' Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVER- Y e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 140 | | | | | | | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 419.01' | | | Bottom of Rock Socket | | | | |
| 143 | | | Dolomite, mod. hd., gray, mod. fracturing and jointing, slightly shaly in places. | 100 | 1 | Run #1 Start 11:15 Stop 11:25 MD Start 142.79' MD Stop 144.68' DD 1.89' REC 1.89' CL 0.0' | |
| 144 | | | | | | | |
| 417.12 | | | | | | | |
| 145 | | | | | | Run #2 Start 11:36 Stop 11:49 MD Start 144.68' MD Stop 149.66' DD 4.98' REC 4.98' CL 0.0' | |
| 146 | | | | | | | |
| 147 | | | | 100 | 1 | | |
| 148 | | | | | | | |
| 149 | | | Dolomite, mod. hd., buff with slight amount of brown shale, mod. fracturing and jointing. Flint, dark gray-brown | | | | |
| 412.14' | | | Dolomite, hd., lt. gray, mod. fracturing and jointing with some iron staining, siliceous. | | | 261 | |
| 150 | | | | | | Run #3 See sheet 2 | |

| | | | | |
|--|--|--|---|-------------------------------|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS |
| 1. PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | |
| 2. LOCATION of Boring H101-P6-West-Rock Core | | 11. Boring No. | | |
| 3. Geotechnician | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | |
| 4. HOLE NO. | | 13. Water Depth | | |
| 5. NAME OF DRILLER | | 14. TOTAL NUMBER CORE BOXES | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 15. Depth of Bottom of Hole | | |
| 7. Boring Method Rotary | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | |
| 8. DEPTH DRILLED INTO ROCK | | 17. ELEVATION TOP OF HOLE | | |
| 9. TOTAL DEPTH OF HOLE | | 18. TOTAL CORE RECOVERY FOR BORING Depth _____ Type _____ | | |

| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | 1 CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|---|------------------------------|------------------------------|---|
| | 150 | | Dolomite, as above. | | | Run #3 Start 12:02 Stop 12:13 MD Start 149.66' MD Stop 153.20' DD 3.54' REC 3.54' CL 0.0 |
| | 151 | | | 100 | 1 | |
| | 152 | | Flint, dark gray-brown. | | | |
| | | | Flint, dark gray-brown. | | | |
| 408.6' | 153 | | Bottom of Rock Core | | | |

| DRILLING LOG | | Project No. DAGW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 of 2 SHEETS | |
|--|------------|----------------------------------|---|--|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H101-P6-East-Rock Core #1 | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Mike Gilley | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 407.8' | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 10/10/81 COMPLETED 10/10/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 11.2' | | | | 17. ELEVATION TOP OF HOLE 561.9' TO Platform | | | |
| 9. TOTAL DEPTH OF HOLE 154.1' | | | | 18. TOTAL CORE RECOVERY FOR BORING 1 | | | |
| | | | | 19. Casing Record Depth 143.4' Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | 3 CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 140 | | | | | | | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 419.0 | | | Bottom of Rock Socket | | | | |
| 143 | | | | | | Run #1 Start 12:14 Stop 12:26 MD Start 142.9' MD Stop 148.93' DD 6.03' REC 4.6' CL 1.43' | |
| 144 | | | 1.43' C.L. | | | | |
| 145 | | | Dolomite, firm to mod. hd., gray-buff, frequent fractures and joints with iron staining. | 76 | 1 | | |
| 146 | | | | | | | |
| 147 | | | | | | | |
| 148 | | | | | | | |
| 412.97 | | | | | | Run #2 See sheet #2 | |
| 149 | | | | | | | |
| 150 | | | | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|---|------------|----------------------------------|---|--|-----------------------------|--|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION OF Boring H101-P6-East-Rock Core #1 | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19. Casing Record Depth _____ Type _____ HW _____ | | | |
| ELEVATION + | DEPTH - | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY % | BOX OR SAMPLE NO 1 | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| | 150 | ○ | Dolomite, as above. Vug without crystals. | | | Run #2 Start 12:50 Stop 1:06 MD Start 148.93' MD Stop 154.10' DD 5.17' REC 5.17' CL 0.0 | |
| | 151 | | Dolomite, mod. hd. to hd., light gray, frequent fractures and 100 joints with some iron staining. | | 1 | | |
| | 152 | ▽ | Vug with calcite crystals. | | | | |
| | 153 | | | | | | |
| 407.8' | 154 | | Bottom of Rock Core | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|--|------------|----------------------------------|---|---|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H101-P6-East-Rock Core #2 | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Mike Gilley | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 408.75' | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE 10/12/81 10/12/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.2' | | | | 17. ELEVATION TOP OF HOLE 561.9' TO Platform | | | |
| 9. TOTAL DEPTH OF HOLE 153.15' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100% | | | |
| | | | | 19. Casing Record Depth 143.45' Type HW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 140 | | | | | | | |
| 141 | | | | | | | |
| 142 | | | | | | | |
| 418.95' | | | Bottom of Rock Socket | | | | |
| 143 | | | Dolomite, firm to mod. hd., buff, slightly weathered, frequent fractures and joints, traces of iron | 100 | 1 | Run #1 Start 11:37 Stop 11:42 MD Start 142.95' MD Stop 145.1' DD 2.15' REC 2.15' CL 0.0' | |
| 144 | | | Broken | | | | |
| 416.8 | | | | | | | |
| 145 | | | Dolomite, mod. hd., gray, shaly, frequent fractures and joints. | | | Run #2 Start 11:50 Stop 12:13 MD Start 145.1' MD Stop 150.0' DD 4.9' REC 4.9' CL 0.0' | |
| 146 | | | | | | | |
| 147 | | | | 100 | 1 | | |
| 148 | | | | | | | |
| 149 | | | Dolomite, mod. hd. to hd., light gray, frequent fractures and joints with some calcite healing and iron staining. | | | | |
| 411.9 | 150 | | Fracture at 150'. | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|---|-------|----------------------------------|--|--|-------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring H101-P6-East-Rock Core #2 | | | | 11. Boring No. | | | |
| 3. Geotechnician | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 408.75' | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 10/12/81 COMPLETED 10/12/81 | | | |
| 8. DEPTH DRILLED INTO ROCK | | | | 17. ELEVATION TOP OF HOLE | | | |
| 9. TOTAL DEPTH OF HOLE | | | | 18. TOTAL CORE RECOVERY FOR BORING 1 | | | |
| | | | | 19. Casing Record Depth Type RW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 1. CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 411.9' | 150 | | Dolomite, as above. | | | Run #3 Start 12:25 Stop 12:37 MD Start 150.0' MD Stop 153.15' DD 3.15' REC 3.15' CL 0.0' | |
| | 151 | | Broken | 100 | 1 | | |
| | 152 | | | | | | |
| 408.75 | 153 | | Bottom of Rock Core | | | | |

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| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 of 2 SHEETS | |
|--|------------|----------------------------------|---|--|------------------------------|---|--|
| 1. PROJECT Norfolk Lake Bridges | | | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2. LOCATION of Boring 101-P7-West-Rock Core | | | | 11. Boring No. | | | |
| 3. Geotechnician Robert Schmoker | | | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4. HOLE NO. | | | | 13. Water Depth | | | |
| 5. NAME OF DRILLER Mike Gilley | | | | 14. TOTAL NUMBER CORE BOXES 1 | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15. Depth of Bottom of Hole 419.92' El. | | | |
| 7. Boring Method Rotary | | | | 16. DATE HOLE STARTED 11/17/81 COMPLETED 11/18/81 | | | |
| 8. DEPTH DRILLED INTO ROCK 10.2' | | | | 17. ELEVATION TOP OF HOLE 564.96' T.O. Platform | | | |
| 9. TOTAL DEPTH OF HOLE 145.04' | | | | 18. TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19. Casing Record Depth 135 Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 130 | | | | | | | |
| 131 | | | | | | | |
| 132 | | | | | | | |
| 133 | | | | | | | |
| 134 | | | | | | | |
| 430.12 | | | Bottom of Rock Socket | | | Run#1 11/17/81 Start 2:45 Stop 2:56 | |
| 135 | | | Dolomite, mod. hd., light gray to gray, mod. fractured and jointed, somewhat shaly, traces of pyrite. | | | M.D. Start 134.84' M.D. Stop 139.98' D.D. 5.14' Rec. 5.14' Cl. 0.0' | |
| 136 | | | | | | | |
| 137 | | | | 100 | 1 | | |
| 138 | | | | | | | |
| 139 | | | | | | | |
| 124.98' | 140 | | | | | | |

267.

| DRILLING LOG | | Project No. DAGW 03-79-C-0055 | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS | | |
|---|------------|---|---|------------------------------|------------------------------|---|
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | | |
| 2 LOCATION of Boring 101-P7-West-Rock Core | | 11 Boring No. | | | | |
| 3 Geotechnician Robert Schmoker | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | | |
| 4 HOLE NO. | | 13 Water Depth | | | | |
| 5 NAME OF DRILLER Mike Gilley | | 14 TOTAL NUMBER CORE BOXES 1 | | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15 Depth of Bottom of Hole 419.92' El. | | | | |
| 7 Boring Method Rotary | | 16 DATE HOLE STARTED 11/17/81 COMPLETED 11/18/81 | | | | |
| 8 DEPTH DRILLED INTO ROCK 10.2' | | 17 ELEVATION TOP OF HOLE 564.96' T.O. Platform | | | | |
| 9 TOTAL DEPTH OF HOLE 145.04' | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | | |
| | | 19 Casing Record Depth 135' Type RW | | | | |
| ELEVATION " | DEPTH ' | LEGEND | CLASSIFICATION OF MATERIALS (Description) d | 1 CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
| 140 | | | Dolomite, as above. | 100 | 1 | Con't. 11/18/81 Run #2 Start 7:26 Stop 7:34 M.D. Start 139.98' M.D. Stop 142.0' D.D. 2.02' Rec. 2.02' C.L. 0.0' |
| 422.96 | 42 | | | 100 | 1 | Run #3 Start 7:45 Stop 7:59 M.D. Start 142.0' M.D. Stop 145.04' D.D. 3.04' Rec. 3.04' C.L. 0.0' |
| 419.92 | 145 | | Bottom of Rock Core | | | |

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| | | | | | | | |
|--|-------|----------------------------------|--|---|------------------------|--|--|
| DRILLING LOG | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101 p7-East-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Lunyear | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 Depth of Bottom of Hole El. 419.56' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 11/17/81 COMPLETED 11/17/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.44' | | | | 17 ELEVATION TOP OF HOLE 559.56' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 140.0' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19 Casing Record Depth 130' Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 1 CORE RECOV- ERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 120 | | | | | | | |
| 121 | | | | | | | |
| 122 | | | | | | | |
| 123 | | | | | | | |
| 124 | | | | | | | |
| 125 | | | | | | | |
| 126 | | | | | | | |
| 127 | | | | | | | |
| 128 | | | | | | | |
| 129 | | | | | | | |
| 430.0' | | | Bottom of Rock Socket | | | 269 | |
| 130 | | | Dolomite, as described below. | | | Run #1 See Sheet #2 | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS | | |
|--|------------|--|---|-------------------------------|------------------------------|---|
| 1. PROJECT Norfolk Lake Bridges | | 10. SIZE AND TYPE OF BIT HQ - Diamond | | | | |
| 2. LOCATION of Boring 101-P7-East-Rock Core | | 11. Boring No. | | | | |
| 3. Geotechnician Robert Schmoker | | 12. MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | | |
| 4. HOLE NO. | | 13. Water Depth | | | | |
| 5. NAME OF DRILLER Mike Gilley | | 14. TOTAL NUMBER CORE BOXES 1 | | | | |
| 6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 15. Depth of Bottom of Hole El. 419.56' | | | | |
| 7. Boring Method Rotary | | 16. DATE HOLE STARTED 11/17/81 COMPLETED 11/17/81 | | | | |
| 8. DEPTH DRILLED INTO ROCK 10.44' | | 17. ELEVATION TOP OF HOLE 559.56' T.O. Platform | | | | |
| 9. TOTAL DEPTH OF HOLE 140.0' | | 18. TOTAL CORE RECOVERY FOR BORING 100 | | | | |
| | | 19. Casing Record Depth 130' Type HW | | | | |
| ELEVATION • | DEPTH • | LEGEND • | CLASSIFICATION OF MATERIALS (Description) • | 1. CORE RECOV- ERY • | BOX OR SAMPLE NO. • | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) • |
| 130 | | | Dolomite, mod. hd., light gray to gray, occasional fractures and joints, shaly, smooth texture, traces of pyrite. | | | Run #1 Start 7:45 Stop 7:58 M.D. Start 129.56' M.D. Stop 134.35' D.D. 4.79' Rec. 4.79' C.L. 0.0' |
| 131 | | | | 100 | 1 | |
| 132 | | | | | | |
| 133 | | | | | | |
| 134 | | | | | | |
| 425.21' | | | | | | |
| 135 | | | | | | Run #2 Start 8:11 Stop 8:22 M.D. Start 134.35' M.D. Stop 139.43' D.D. 5.08' Rec. 5.08' C.L. 0.0' |
| 136 | | | | 100 | 1 | |
| 137 | | | | | | |
| 138 | | | | | | Run #3 Start 8:38 Stop 8:40 M.D. Start 139.43' M.D. Stop 140.0' D.D. .57' Rec. .57' C.L. 0.0' |
| 139 | | | | | | |
| 420.13' | | | | | | |
| 419.56' | 140 | | Bottom of Rock Core | 100 | 1 | |

270

| DRILLING LOG | | Project No. DACH 03-79-C-0055 | Contractor Hassman Construction Company | | SHEET 1 of 2 SHEETS | |
|--|-------|--|--|--|------------------------|---|
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | 11 Boring No. | | |
| 2 LOCATION of Boring 101-P8-West-Rock Core | | MANUFACTURER'S DESIGNATION OF DRILL LUNGEAR | | | | |
| 3 Geotechnician Robert Schmoker | | 13 Water Depth | | | | |
| 4 HOLE NO. | | 14 TOTAL NUMBER CORE BOXES 1 | | | | |
| 5 NAME OF DRILLER Mike Gilley | | 15 Depth of Bottom of Hole 124.01' | | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 16 DATE HOLE 11/4/81 | | 17 ELEVATION TOP OF HOLE 562.14' T.O. Platform | | |
| 7 Boring Method Rotary | | 18 TOTAL CORE RECOVERY FOR BORING 100 % | | 19 Casing Record Depth 128.43' Type HW | | |
| 8 DEPTH DRILLED INTO ROCK 10.03' | | 9 TOTAL DEPTH OF HOLE 138.13' | | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
| 120 | | | | | | |
| 121 | | | | | | |
| 122 | | | | | | |
| 123 | | | | | | |
| 124 | | | | | | |
| 125 | | | | | | |
| 126 | | | | | | |
| 127 | | | | | | |
| 128 | | | | | | Run #1 Start 8:14 Stop 8:18 M.D. Start 128 M.D. Stop 128.4 D.D. .3' Rec. .3' C.L. 0.0' |
| 128.04 | | | Bottom of Rock Socket | | | |
| 128.74 | | | Dolomite, mod. hd., light gray to gray, mod. fracturing and jointing, shaly, smooth texture. | 100 | | Run #2 Start 9:48 Stop 10:07 M.D. Start 128.4' M.D. Stop 133.31' D.D. 4.91' Rec. 4.91' C.L. 0.0' |
| 129 | | | Broken | 100 | 1 | |
| 130 | | | | | | |

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|---|-------|----------------------------------|--|--|-------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101-P8-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole 424.01' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 11/4/81 COMPLETED 11/4/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.03' | | | | 17 ELEVATION TOP OF HOLE 562.14' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 138.13' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 % | | | |
| | | | | 19 Casing Record Depth 128.43' Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 130 | | | Dolomite, as above. | | | Con't. Run #2 (see sheet #1) | |
| 131 | | | | 100 | 1 | | |
| 132 | | | | | | | |
| 133 | | | | | | | |
| 428.83' | | | | | | | |
| 134 | | | | | | Run #3 Start 10:22 Stop 10:35 M.D. Start 133.31' M.D. Stop 138.13' D.D. 4.82' Rec. 4.82' C.L. 0.0' | |
| 135 | | | | 100 | 1 | | |
| 136 | | | | | | | |
| 137 | | | | | | | |
| 138 | | | | | | | |
| 424.01' | | | Bottom of Rock Core | | | | |

272

| DRILLING LOG | | Project No. DACW 01-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|---|------------|--|--|---|------------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | 11 Boring No. | | | |
| 2 LOCATION of Boring 101-P8-East-Rock CORB | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | 13 Water Depth | | | |
| 3 Geotechnician Robert Schomoker | | 14 TOTAL NUMBER CORE BOXES | | 15 Depth of Bottom of Hole | | | |
| 4 HOLE NO. | | 16 DATE HOLE STARTED 11/2/81 COMPLETED 11/2/81 | | 17 ELEVATION TOP OF HOLE 561.53' T.O. Platform | | | |
| 5 NAME OF DRILLER Mike Gilley | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | 19 Casing Record Depth 127.45' Type RW | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | 7 Boring Method Rotary | | 8 DEPTH DRILLED INTO ROCK 10.25' | | 9 TOTAL DEPTH OF HOLE 137.5' | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| 120 | | | | | | | |
| 121 | | | | | | | |
| 122 | | | | | | | |
| 123 | | | | | | | |
| 124 | | | | | | | |
| 125 | | | | | | | |
| 126 | | | | | | | |
| 127 | | | Bottom of Rock Socket | | | | |
| 434.28 | | | | | | | |
| 128 | | | Dolomite, mod. hd., light gray to gray, frequent fractures and joints, shaly, smooth texture. | 100 | 1 | Run#1 Start 12:38 Stop 12:45 M.D. Start 127.25' M.D. Stop 130.1' D.D. 2.85' Rec. 2.85' C.L. 0.0' | |
| 129 | | | | | | | |
| 130 | | | | | | | |

273

| | | | | | | | |
|--|--|---|--|---|--|-------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Hassman Construction Company | | SHEET 2 OF 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101-P8-East-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 11/2/81 COMPLETED 11/2/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.25' | | | | 17 ELEVATION TOP OF HOLE 361.53' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 137.5 | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19 Casing Record Depth 127.45' Type RW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|--|--------------------|-------------------------|---|
| 431.43 | 130 | | Dolomite, as above. | | | Run #1-See Sheet 1 |
| | 131 | | | | | Run #2 Start 12:58 Stop 1:08 M.D. Start 130.1' M.D. Stop 135.15' D.D. 5.05' Rec. 5.05' C.L. 0.0' |
| | 132 | | | 100 | 1 | |
| | 133 | | | | | |
| | 134 | | | | | |
| | 135 | Broken | | | | |
| 426.38 | | | | | | Run #3 Start 1:22 Stop 1:28 M.D. Start 135.15' M.D. Stop 137.5' D.D. 2.35' Rec. 2.35' C.L. 0.0' |
| | 136 | | | 100 | 1 | |
| | 137 | | | | | |
| 424.03 | | | Bottom of Rock Core | | | |

274

| DRILLING LOG | | Project No. DACW 01-79-C-0055 | Contractor Massman Construction Company | SHEET 1 OF 2 SHEETS | | |
|---|-------|----------------------------------|---|-------------------------|------------------------|---|
| 1 PROJECT Norfolk Lake Bridges | | | 10 SIZE AND TYPE OF BIT RQ - Diamond | | | |
| 2 LOCATION of Boring 101-p9-West-Rock Core | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear -HC-150 | | | |
| 4 HOLE NO. | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gillev | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DES. FROM VERT. | | | 15 Depth of Bottom of Hole El: 425.15' | | | |
| 7 Boring Method Rotary | | | 16 DATE HOLE STARTED 12-14-81 COMPLETED 12-14-81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.0' | | | 17 ELEVATION TOP OF HOLE 560.4' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 135.25' | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | 19 Casing Record Depth 126' Type RW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOV- ERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
| 120.6 | | | | | | |
| 121 | | | | | | |
| 122 | | | | | | |
| 123 | | | | | | |
| 124 | | | | | | |
| 125 | | | | | | |
| 435.15' | | | Bottom of Rock Socket | | | |
| 126 | | | Dolomite, mod. hd., buff to light gray, mod. frac. and joints, traces of shale, occ. chert or flint. | | | Run #1 Start 12:00 Stop 12:11 M.D. Start 125.25' M.D. Stop 130.11' D.D. 4.86' Rec. 4.86' C.L. 0.0' |
| 127 | | | | 100 | 1 | |
| 128 | | | | | | |
| 129 | | | | | | |
| 430.40' | 130 | | | | | |

275

| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 of 2 SHEETS | |
|---|-------|----------------------------------|--|--|-------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101-p9-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear -HC-150 | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BORES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole El: 425.15' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 12-14-81 COMPLETED 12-14-81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.0' | | | | 17 ELEVATION TOP OF HOLE 560.4' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 135.25' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19 Casing Record Depth 126' Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 1 CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 430.40' | 130.6 | | | | | Run #1 See Sheet #1 | |
| 430.29 | | | Dolomite, as above. | | | Run #2 | |
| | | | | | | Start 12:26 | |
| | | | | | | Stop 12:40 | |
| | | | | | | M.D. Start 130.11' | |
| | | | | | | M.D. Stop 135.25' | |
| | | | | | | D.D. 5.14' | |
| | | | | | | Rec. 5.14' | |
| | | | | | | C.L. 0.0' | |
| | | | | 100 | 1 | | |
| | | | Chert, hd., light gray. | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 425.15 | 135 | | Flint, hd, dark gray-brown Vugs with quartz crystals Bottom of Rock Core | | | | |

276

| | | | | | | | |
|--|--|---|--|---|--|-------------------------------|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Hassman Construction Company | | SHEET 1 OF 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring 101-P9-East-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear-HC-150 | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole El: 424.66' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 12-11-81 COMPLETED 12-11-81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.7' | | | | 17 ELEVATION TOP OF HOLE 560.76' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 136.1' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19 Casing Record Depth 126' Type RW | | | |

| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|----------------|------------|-------------|--|------------------------------|------------------------------|---|
| 120 | | | | | | |
| 121 | | | | | | |
| 122 | | | | | | |
| 123 | | | | | | |
| 124 | | | | | | |
| 125 | | | | | | |
| 435.36 | | | Bottom of Rock Socket | | | |
| 126 | | | Dolomite, mod. hd., buff to light gray, mod. to frequent fractures and joints as depth increases, occ. trace of shale and chert. | | | Run #1 Start 10:41 Stop 10:59 M.D. Start 125.4' M.D. Stop 130.2' D.D. 4.8' Rec. 4.8' C.L. 0.0' |
| 127 | | | | 100 | 1 | |
| 128 | | | | | | |
| 129 | | | | | | |
| 430.76 | 130 | | | | | |

| DRILLING LOG | | Project No. DACH 01-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|---|-------|----------------------------------|--|---|------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring H101-P9-East-Rock CO | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longyear-HC-150 | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES 1 | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole FT. 424.66' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED 12-11-81 COMPLETED 12-11-81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.7' | | | | 17 ELEVATION TOP OF HOLE 560.76' T.O. Platform | | | |
| 9 TOTAL DEPTH OF HOLE 136.1' | | | | 18 TOTAL CORE RECOVERY FOR BORING 100 | | | |
| | | | | 19 Casing Record Depth 126.0' Type HW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVER- ERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 430.76' | 130 | | | | | Con't. | |
| 430.56' | | | Dolomite, as above. | | | Run #1-See sheet #1 | |
| | | | | 100 | 1 | Run #2 | |
| | | | | | | Start 11:10 | |
| | | | | | | Stop 11:15 | |
| | | | | | | M.D. Start 130.2' | |
| | | | | | | M.D. Stop 131.45' | |
| | | | | | | D.D. 1.25' | |
| | | | | | | Rec. 1.25' | |
| | | | | | | C.L. 0.0' | |
| 429.31' | | | | | | Run #3 | |
| | | | | | | Start 11:28 | |
| | | | | | | Stop 11:44 | |
| | | | | 100 | 1 | M.D. Start 131.45' | |
| | | | | | | M.D. Stop 133.9' | |
| | | | | | | D.D. 2.45' | |
| | | | | | | Rec. 2.45' | |
| | | | | | | C.L. 0.0' | |
| | | | Broken with some chert. | | | | |
| 426.86' | | | Chert, hd., gray | | | Run #4 | |
| | | | | | | Start 11:55 | |
| | | | | | | Stop 12:07 | |
| | | | | | | M.D. Start 133.9' | |
| | | | | 100 | 1 | M.D. Stop 136.1' | |
| | | | | | | D.D. 2.2' | |
| | | | | | | Rec. 2.2' | |
| | | | | | | C.L. 0.0' | |
| | | | Broken Chert, hd., gray | | | | |
| 424.66' | 136 | | Bottom of Rock Core | | | | |

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| DRILLING LOG | | Project No. DACW 03-70-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
|---|-------|----------------------------------|---|---|------------------------|---|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT RQ - Diamond | | | |
| 2 LOCATION H10-110-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician Robert Schmoker | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Lungyear HC 150 | | | |
| 4 HOLE NO | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER Mike Gilley | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole 452.15' | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE 10/5/81 10/6/81 | | | |
| 8 DEPTH DRILLED INTO ROCK 10.00' | | | | 17 ELEVATION TOP OF HOLE 557.0' TO Platform | | | |
| 9 TOTAL DEPTH OF HOLE 104.85' | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth 95' Type RW | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 90 | | | | | | | |
| 91 | | | | | | | |
| 92 | | | | | | | |
| 93 | | | | | | | |
| 94 | | | | | | | |
| 462.15' | | | Bottom of Rock Socket | | | | |
| 95 | | | Broken | | | Run #1 Start 4:47 Stop 4:55 MD Start 94.85' MD Stop 99.68' DD 4.83' REC 4.83' CL 0.0 | |
| 96 | | | Dolomite, Mod. hd. to hd., gray to gray-buff, frequent fractures and joints with some calcite healing, traces of shale, occ. vugs with calcite crystals. | 100 | 1 | | |
| 97 | | | | | | | |
| 98 | | | | | | | |
| 99 | | Δ | Vug with calcite crystals | | | | |
| 457.32' | | | | | | | |
| 100 | | | Vugs with calcite crystals | | | | |

| DRILLING LOG | | Project No. DACW 01-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 OF 2 SHEETS | |
|--|------------|----------------------------------|---|--|-----------------------------|--|--|
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT RQ - Diamond | | | |
| 2 LOCATION OF Boring H101-P10-West-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Lungyear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE STARTED _____ COMPLETED _____ | | | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth _____ Type RW | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g | |
| | 100 | | Dolomite as above. | | | Run #2 Start 7:05 Stop 7:30 MD Start 99.68' MD Stop 104.85' DD 5.17' REC 5.17' CL 0.0 | |
| | 101 | | | | | | |
| | 102 | | | 100 | 1 | | |
| | 103 | | | | | | |
| | 104 | | | | | | |
| 452.15 | | | Broken Bottom of Rock Core | | | | |

280

| | | | | | | | |
|---|-------|---|---|---|-------------------------|--|--|
| DRILLING LOG | | Project No. DACW 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 1 OF 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | 10 SIZE AND TYPE OF BIT RQ - Diamond | | 11 Boring No. | | | |
| 2 LOCATION of Boring H101-P10-East-Rock Core | | 12 MANUFACTURER'S DESIGNATION OF DRILL Longveer HC - 150 | | 13 Water Depth | | | |
| 3 Geotechnician Robert Schmoker | | 14 TOTAL NUMBER CORE BOXES | | 15 Depth of Bottom of Hole 452.69' | | | |
| 4 HOLE NO | | 16 DATE HOLE | | 17 ELEVATION TOP OF HOLE 557.6' TO Platform | | | |
| 5 NAME OF DRILLER Mike Gilley | | 18 TOTAL CORE RECOVERY FOR BORING | | 19 Casing Record | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | 19 Casing Record | | Type | | | |
| 7 Boring Method Rotary | | 19 Casing Record | | Type | | | |
| 8 DEPTH DRILLED INTO ROCK 10.06' | | 19 Casing Record | | Type | | | |
| 9 TOTAL DEPTH OF HOLE 104.91' | | 19 Casing Record | | Type | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 1 CORE RECOV. ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) | |
| 90 | | | | | | | |
| 91 | | | | | | | |
| 92 | | | | | | | |
| 93 | | | | | | | |
| 94 | | | | | | | |
| 462.75 | | | Bottom of Rock Socket | | | | |
| 95 | | | Dolomite, mod. hd. to hd., gray, frequent fractures and joints with some calcite healing, occ. shaly, some druses and vugs. | | | Run #1 Start 12:55 Stop 1:12 MD Start 94.85' MD Stop 99.85' DD 5.0 REC 5.0 CL 0.0 | |
| 96 | | | | | | | |
| 97 | | | | 100 | 1 | | |
| 98 | | | | | | | |
| 99 | | | | | | | |
| 457.75 | | | Druses with dolomite crystals. | | | | |
| 100 | | | Vug with calcite crystals. | | | Run #2 See sheet 2 | |

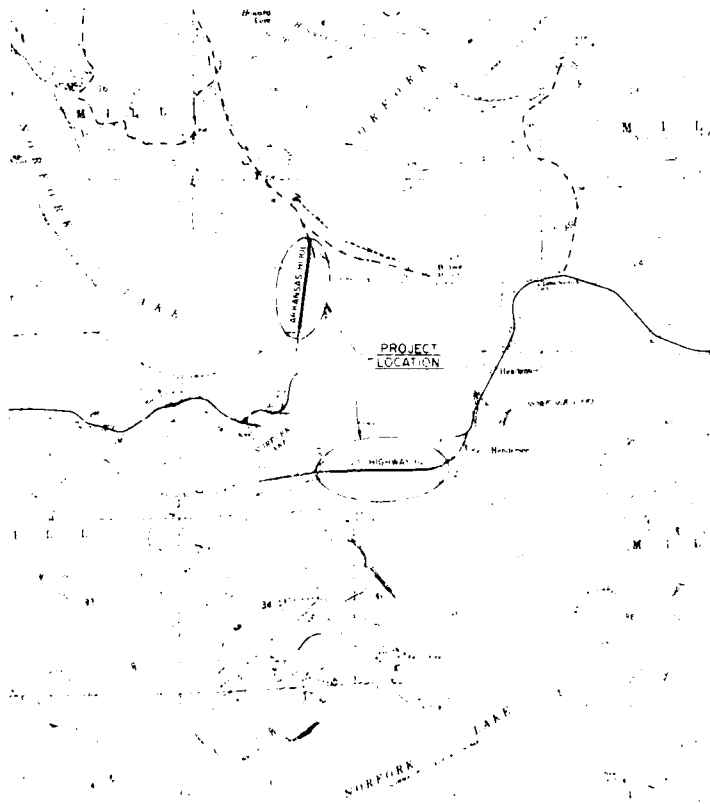
281

| | | | | | | | |
|--|--|---|--|---|--|---------------------------------|--|
| DRILLING LOG | | Project No. DACH 03-79-C-0055 | | Contractor Massman Construction Company | | SHEET 2 of 2 SHEETS | |
| 1 PROJECT Norfolk Lake Bridges | | | | 10 SIZE AND TYPE OF BIT HQ - Diamond | | | |
| 2 LOCATION of Boring H101-P10-East-Rock Core | | | | 11 Boring No. | | | |
| 3 Geotechnician | | | | 12 MANUFACTURER'S DESIGNATION OF DRILL Lungvear | | | |
| 4 HOLE NO. | | | | 13 Water Depth | | | |
| 5 NAME OF DRILLER | | | | 14 TOTAL NUMBER CORE BOXES | | | |
| 6 DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG FROM VERT. | | | | 15 Depth of Bottom of Hole | | | |
| 7 Boring Method Rotary | | | | 16 DATE HOLE | | STARTED COMPLETED | |
| 8 DEPTH DRILLED INTO ROCK | | | | 17 ELEVATION TOP OF HOLE | | | |
| 9 TOTAL DEPTH OF HOLE | | | | 18 TOTAL CORE RECOVERY FOR BORING | | | |
| | | | | 19 Casing Record Depth _____ Type HW | | | |

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|-----------|-------|--------|--|--------------------|------------------------|---|
| 100 | | | Vug with calcite crystals. | | | Run #2 Start 1:22 Stop 1:38 MD Start 99.85 MD Stop 104.91 DD 5.06' REC 5.06' CL 0.0 |
| | | | Vugs with calcite crystals. | | | |
| | | | Dolomite as above. | | | |
| 101 | | | | | | |
| | | | | | | |
| 102 | | | | 100 | 1 | |
| 103 | | | | | | |
| 104 | | | | | | |
| 452.69 | | | Bottom of Rock Core | | | |

APPENDIX D

PLATES



SCALE IN FEET
0 2000 4000 6000

| INDEX TO DRAWINGS | |
|----------------------------------|--------------------------------|
| FILE NO. 9687 | TITLE |
| DRAWING NO. SHEET NO. | GENERAL |
| 134/3020 | PROJECT LOCATION INDEX TO DRAW |
| 134/3021 | ORGANIZATION CHART |
| 134/2707 | GEN. PLAN ELEVATION - HWY |
| 134/2708 | EMBANKMENT DETAILS - HWY |
| 134/2727 | GEN. PLAN ELEVATION - HWY |
| 134/2728 | EMBANKMENT DETAILS - HWY |
| ROCK SOCKET INSPECTION - HWY 62 | |
| 134/3022 | PIER 2 NORTH SOCKET |
| 134/3023 | PIER 2 SOUTH SOCKET |
| 134/3024 | PIER 3 NORTH SOCKET |
| 134/3025 | PIER 3 SOUTH SOCKET |
| 134/3026 | PIER 4 NORTH SOCKET |
| 134/3027 | PIER 4 SOUTH SOCKET |
| 134/3028 | PIER 5 NORTH SOCKET |
| 134/3029 | PIER 5 SOUTH SOCKET |
| 134/3030 | PIER 6 NORTH SOCKET |
| 134/3031 | PIER 6 SOUTH SOCKET |
| 134/3032 | PIER 7 NORTH SOCKET |
| 134/3033 | PIER 7 SOUTH SOCKET |
| 134/3034 | PIER 8 NORTH SOCKET |
| 134/3035 | PIER 8 SOUTH SOCKET |
| 134/3036 | PIER 9 NORTH SOCKET |
| 134/3037 | PIER 9 SOUTH SOCKET |
| 134/3038 | PIER 10 NORTH SOCKET |
| 134/3039 | PIER 10 SOUTH SOCKET |
| 134/3040 | PIER 11 NORTH SOCKET |
| 134/3041 | PIER 11 SOUTH SOCKET |
| 134/3042 | PIER 12 NORTH SOCKET |
| 134/3043 | PIER 12 SOUTH SOCKET |
| 134/3044 | PIER 13 NORTH SOCKET |
| 134/3045 | PIER 13 SOUTH SOCKET |
| ROCK SOCKET INSPECTION - HWY 101 | |
| 134/3046 | PIER WEST SOCKET |
| 134/3047 | PIER EAST SOCKET (CONT.) |
| 134/3048 | PIER EAST SOCKET |
| 134/3049 | PIER 2 EAST SOCKET |
| 134/3050 | PIER 2 WEST SOCKET |
| 134/3051 | PIER 3 WEST SOCKET |
| 134/3052 | PIER 3 EAST SOCKET |
| 134/3053 | PIER 4 WEST SOCKET |
| 134/3054 | PIER 4 EAST SOCKET |
| 134/3055 | PIER 5 WEST SOCKET (CONT.) |
| 134/3056 | PIER 5 WEST SOCKET |
| 134/3057 | PIER 5 EAST SOCKET (CONT.) |
| 134/3058 | PIER 5 EAST SOCKET |
| 134/3059 | PIER 6 EAST SOCKET |
| 134/3060 | PIER 6 WEST SOCKET |
| 134/3061 | PIER 6 WEST SOCKET |
| 134/3062 | PIER 7 EAST SOCKET |
| 134/3063 | PIER 7 EAST SOCKET |
| 134/3064 | PIER 8 WEST SOCKET |
| 134/3065 | PIER 8 EAST SOCKET |
| 134/3066 | PIER 9 WEST SOCKET |
| 134/3067 | PIER 9 EAST SOCKET |
| 134/3068 | PIER 10 WEST SOCKET |

WORK SAFELY

THE ENGINEERING WILL INCREASE YOUR PROFIT

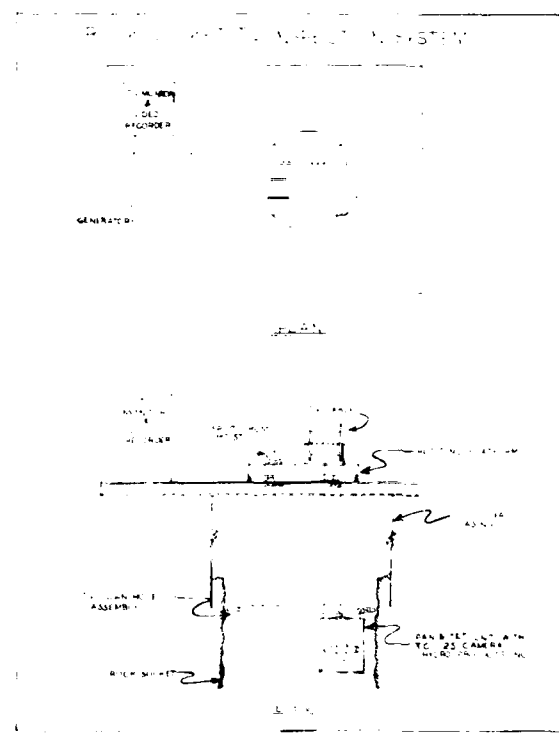
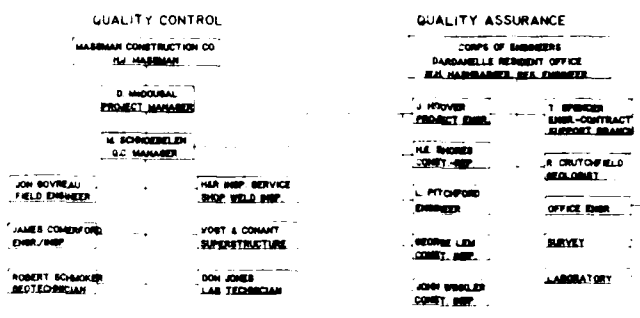
NORFOLK BRIDGES PROJECT
ORGANIZATION CHART

| INDEX TO DRAWINGS | |
|---------------------|-------|
| FILE NO 9687 | TITLE |
| DRAWING NO SHEET NO | |
| GENERAL | |

| PROJECT LOCATION INDEX TO DRAWINGS | |
|------------------------------------|--|
| 134/302 | ORGANIZATION CHART - INSPECTION SYSTEM |
| 134/302 | GEN PLAN & ELEVATION - HWY 62 BRIDGE |
| 134/302 | EMBANKMENT DETAILS - HWY 62 BRIDGE |
| 134/302 | GEN PLAN & ELEVATION - HWY 101 BRIDGE |
| 134/302 | EMBANKMENT DETAILS - HWY 101 BRIDGE |

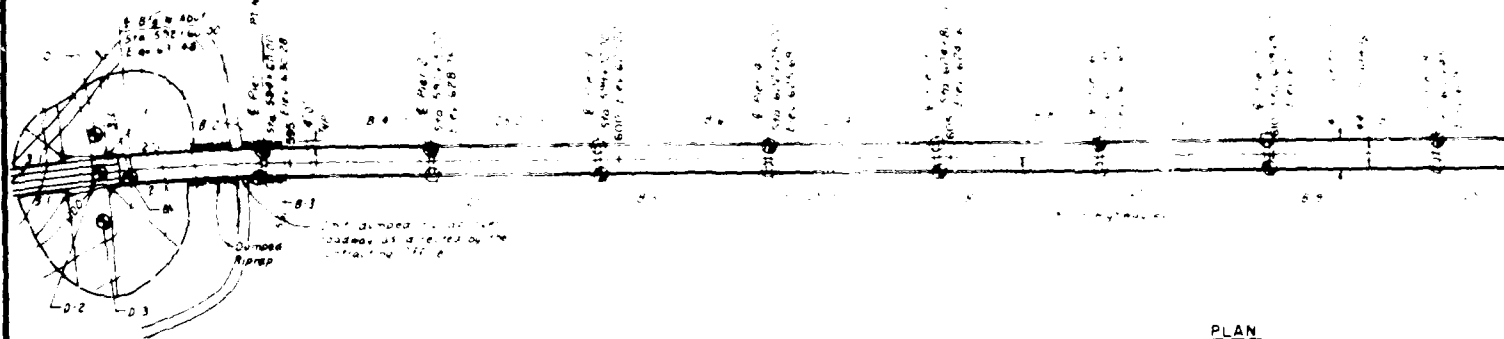
| ROCK SOCKET INSPECTION - HWY 62 BRIDGE | |
|--|----------------------|
| 134/3022 | PIER 2 NORTH SOCKET |
| 134/3023 | PIER 3 SOUTH SOCKET |
| 134/3024 | PIER 3 SOUTH SOCKET |
| 134/3025 | PIER 3 SOUTH SOCKET |
| 134/3026 | PIER 4 NORTH SOCKET |
| 134/3027 | PIER 4 SOUTH SOCKET |
| 134/3028 | PIER 5 NORTH SOCKET |
| 134/3029 | PIER 5 SOUTH SOCKET |
| 134/3030 | PIER 6 NORTH SOCKET |
| 134/3031 | PIER 6 SOUTH SOCKET |
| 134/3032 | PIER 7 NORTH SOCKET |
| 134/3033 | PIER 7 SOUTH SOCKET |
| 134/3034 | PIER 8 NORTH SOCKET |
| 134/3035 | PIER 8 SOUTH SOCKET |
| 134/3036 | PIER 9 NORTH SOCKET |
| 134/3037 | PIER 9 SOUTH SOCKET |
| 134/3038 | PIER 10 NORTH SOCKET |
| 134/3039 | PIER 10 SOUTH SOCKET |
| 134/3040 | PIER 11 NORTH SOCKET |
| 134/3041 | PIER 11 SOUTH SOCKET |
| 134/3042 | PIER 12 NORTH SOCKET |
| 134/3043 | PIER 12 SOUTH SOCKET |
| 134/3044 | PIER 13 NORTH SOCKET |
| 134/3045 | PIER 13 SOUTH SOCKET |

| ROCK SOCKET INSPECTION - HWY 101 BRIDGE | |
|---|---------------------------|
| 134/3046 | PIER 1 WEST SOCKET |
| 134/3047 | PIER 1 EAST SOCKET (CONT) |
| 134/3048 | PIER 2 EAST SOCKET |
| 134/3049 | PIER 2 EAST SOCKET |
| 134/3050 | PIER 2 WEST SOCKET |
| 134/3051 | PIER 3 WEST SOCKET |
| 134/3052 | PIER 3 EAST SOCKET |
| 134/3053 | PIER 4 WEST SOCKET |
| 134/3054 | PIER 4 EAST SOCKET |
| 134/3055 | PIER 5 WEST SOCKET (CONT) |
| 134/3056 | PIER 5 WEST SOCKET |
| 134/3057 | PIER 5 EAST SOCKET (CONT) |
| 134/3058 | PIER 5 EAST SOCKET |
| 134/3059 | PIER 6 EAST SOCKET |
| 134/3060 | PIER 6 WEST SOCKET |
| 134/3061 | PIER 6 EAST SOCKET |
| 134/3062 | PIER 7 WEST SOCKET |
| 134/3063 | PIER 7 EAST SOCKET |
| 134/3064 | PIER 8 WEST SOCKET |
| 134/3065 | PIER 8 EAST SOCKET |
| 134/3066 | PIER 9 WEST SOCKET |
| 134/3067 | PIER 9 EAST SOCKET |
| 134/3068 | PIER 10 WEST SOCKET |

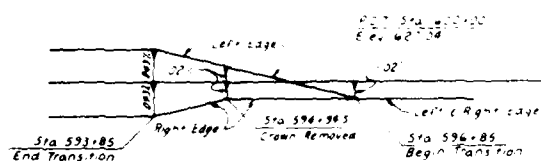


| | | |
|--|-----------------------------|------------------------------------|
| REVISION | DATE | DESCRIPTION |
| 1 | | |
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | | |
| DESIGNED BY | WHITE RIVER AND TRIBUTARIES | NORTH FORK RIVER, ARKANSAS |
| DRAWN BY | RC | NORFOLK LAKE HIGHWAY BRIDGES |
| CHECKED BY | RC | BAXTER COUNTY, ARKANSAS |
| SUBMITTED BY | CD | US HIGHWAY 62 & ARKANSAS HWY 101 |
| ENGINEER | | LOCATION MAP AND INDEX TO DRAWINGS |
| | | APRIL 1963 |
| | | 9687-134/3020 |

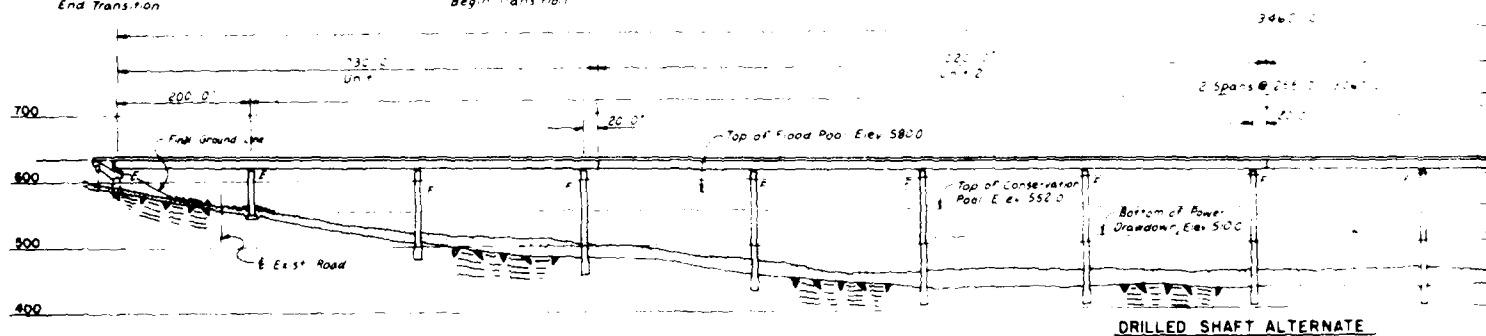
JAVE NO 4
 1. 4034 0
 2. 2000
 3. 2064 709
 4. 366 197
 5. 25 310
 6. 728 445



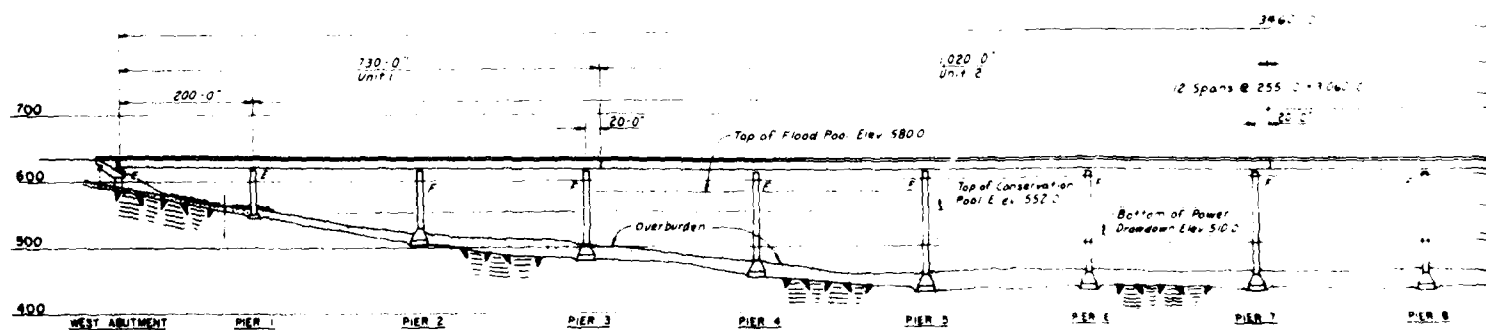
PLAN



PROFILE GRADE



DRILLED SHAFT ALTERNATE



BELLED FOOTING ALTERNATE

Notes
1. 0309
Specif
shown
contam

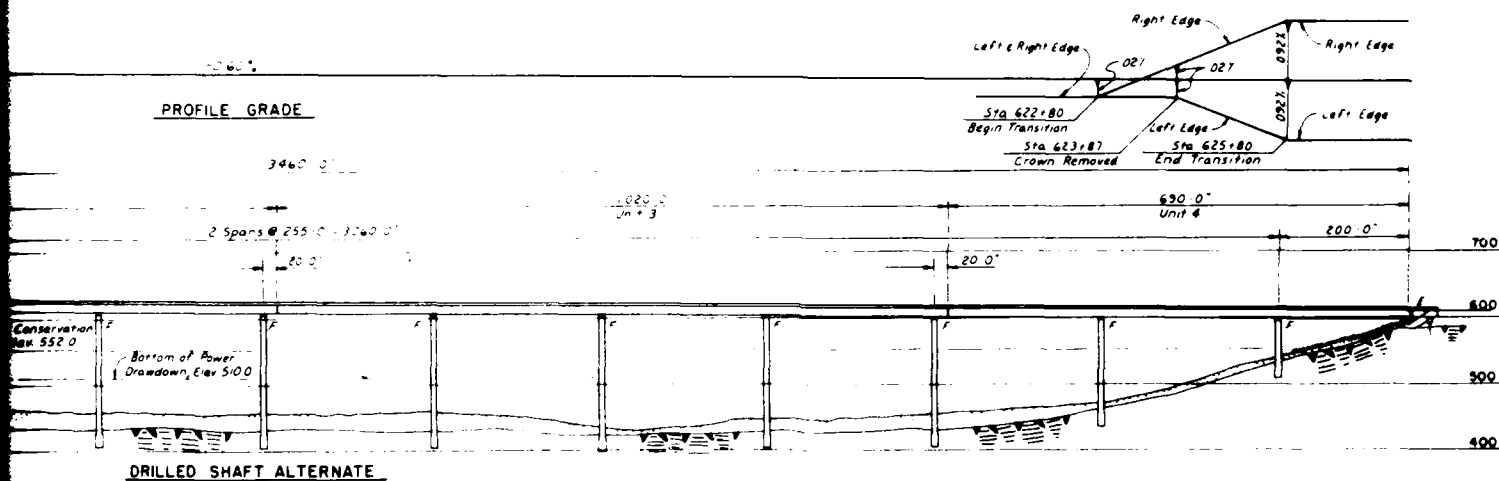
LEGEND

CURVE NO. 3A

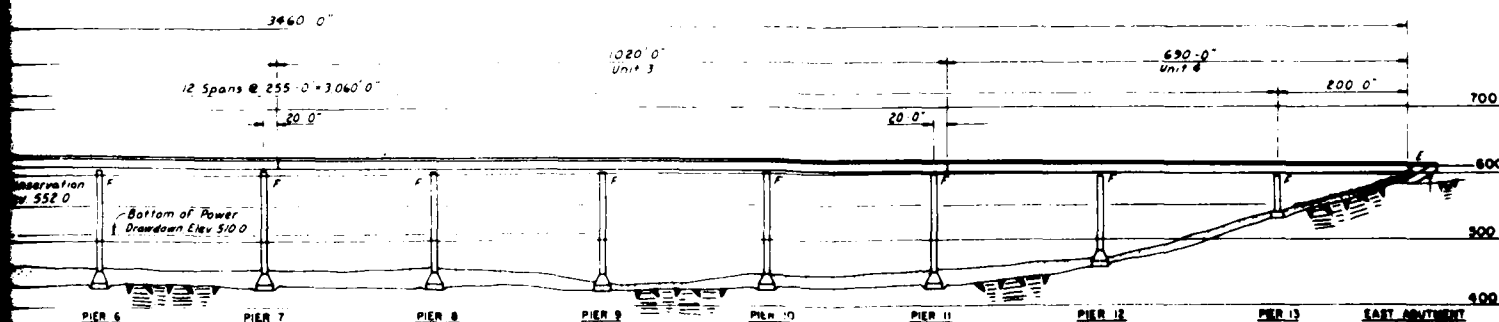
$\Delta = 58^{\circ} 3' 31''$
 $D = 5^{\circ} 00'$
 $R = 1145.916$
 $T = 642.077$
 $E = 67.624$
 $L = 170.506'$

PLAN

PROFILE GRADE



DRILLED SHAFT ALTERNATE

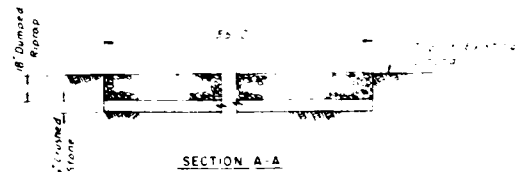
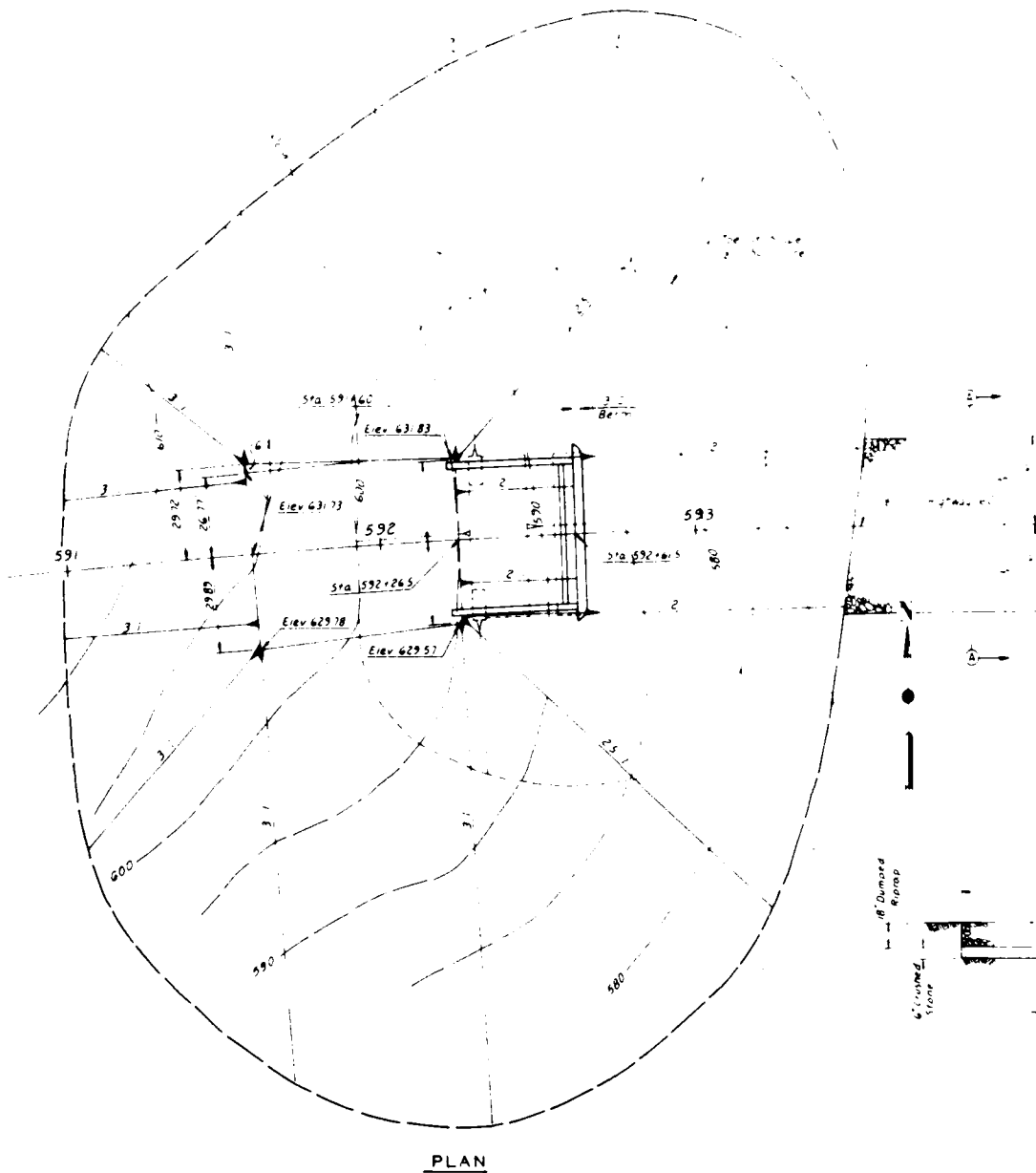


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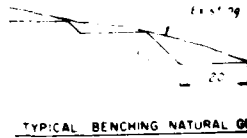
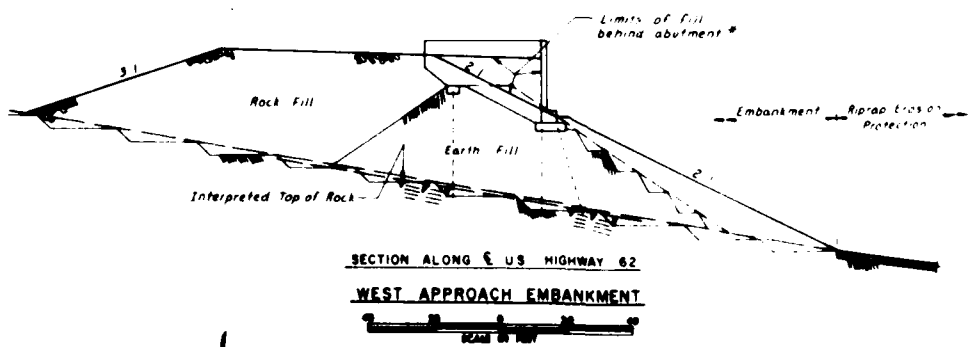
100 0 100
 SCALE IN FEET

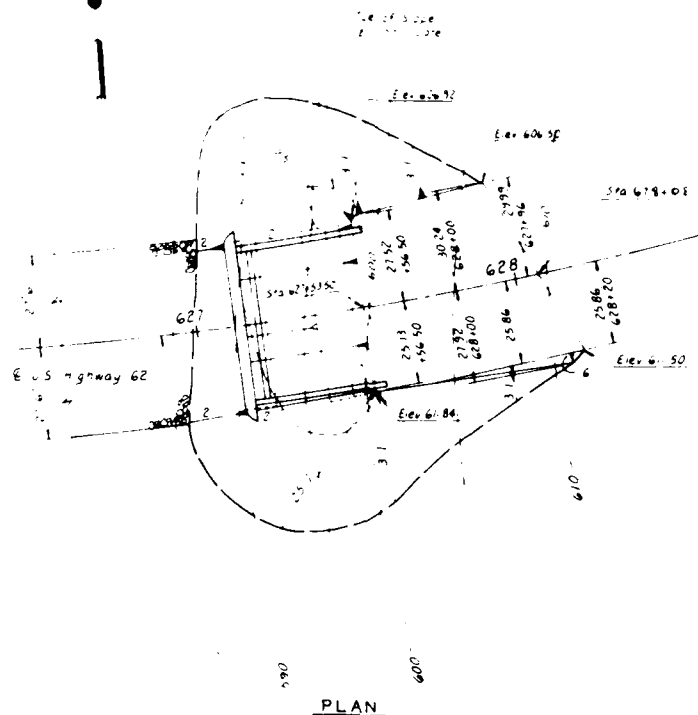
Notes
 For embankment and riprap details see Sheet 8
 For limits of Contractors Work Areas see Sheet 2
 Boring logs and laboratory and field test data from subsurface explorations are included with the Contract Specifications
 Dumped riprap shall be provided at ends of bridge as shown. Riprap shall be placed from abutment to Elevation 550 contour line.

| | | | |
|---|--|---|--|
| HNTP NORTH CAROLINA HIGHWAY TRUST FUND | | U.S. ARMY ENGINEER DISTRICT FORT MONROE, VIRGINIA | |
| NORFOLK LAKE HIGHWAY BRIDGES SOUTHERN DISTRICT, VIRGINIA SUBSTRUCTURE U.S. HIGHWAY 62 GENERAL PLAN AND ELEVATION | | | |
| DATE: FEBRUARY 1979 DRAWN BY: [Signature] CHECKED BY: [Signature] | | FEBRUARY 1979 DRAWN BY: [Signature] CHECKED BY: [Signature] | |
| 8435-134/2707 -2 of 3 | | 8435-134/2707 -2 of 3 | |

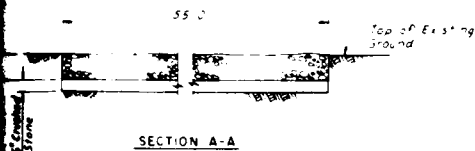


*Note
Fill behind abutments shall be placed after abutments are completed. Fill material may be either earth or rock or both except material adjacent to walls must be non-shrinkable. Backfill as shown on abutment drawings. The cost of furnishing and placing fill behind abutments shall be considered incidental to and included with the price bid for Unclassified Excavation Abutments.

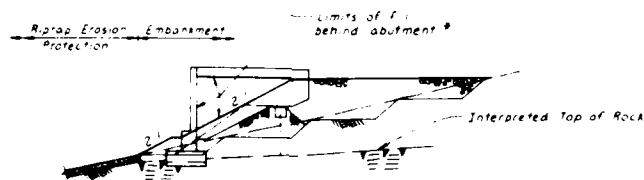




PLAN



SECTION A-A

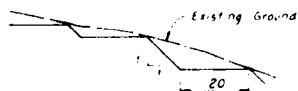


SECTION ALONG E US HIGHWAY 62

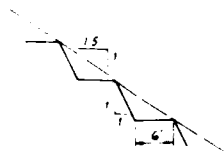
EAST APPROACH EMBANKMENT



Abutments shall be placed after abutments are
material may be either earth or rock or both
adjacent to walls must be Noncohesive Backfill
element drawings The cost of furnishing and placing
ments shall be considered incidental to and included
for Unclassified Excavation Abutments



TYPICAL BENCHING NATURAL GROUND



TYPICAL KEYING SOIL CORE

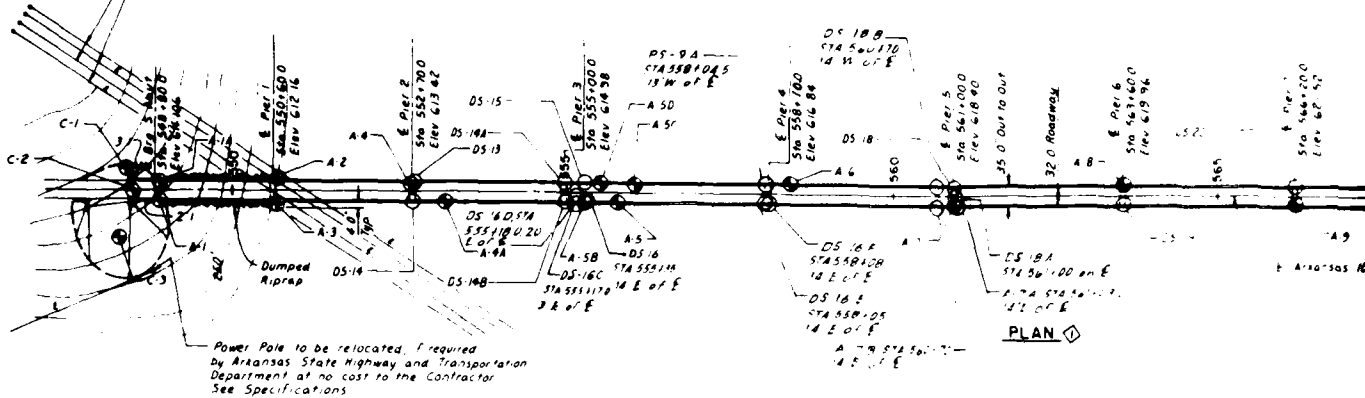
| | | | |
|---|--|---|---------------------------|
| INTE INFORMATION CONTAINED HEREIN IS UNCLASSIFIED | | U.S. ARMY ENGINEER DISTRICT FT. WORTH TEXAS | |
| COJ/JFP RLR NML [Signature] [Signature] | NORTH OVEE AND TREATISES NORFOLK LAKE HIGHWAY BRIDGES BAKER COUNTY ARKANSAS SUBSTRUCTURE U.S. HIGHWAY 62 EMBANKMENT DETAILS | | NORTH FORK OVEE, ARKANSAS |
| [Signature] [Signature] A. R. [Signature] [Signature] | | FEBRUARY 1976 DRAWN BY ENGINEER [Signature] | |
| [Signature] | | 8435-134/2708 - 30 - | |

LEGEND

As Drilled Boring (1977)

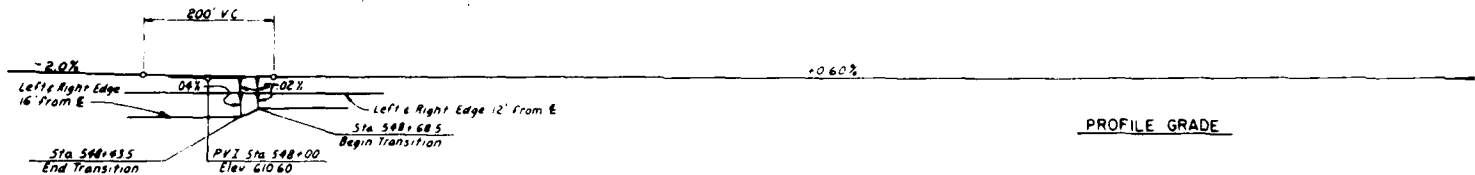
As Drilled Boring (1979)

3 phase 72 KV Power Distribution Lines cross E. Bridge at Sta 550+60. Elev 681.1 @ 80' F. These lines are scheduled to be removed but a definite time has not been established. See Contract Specifications.

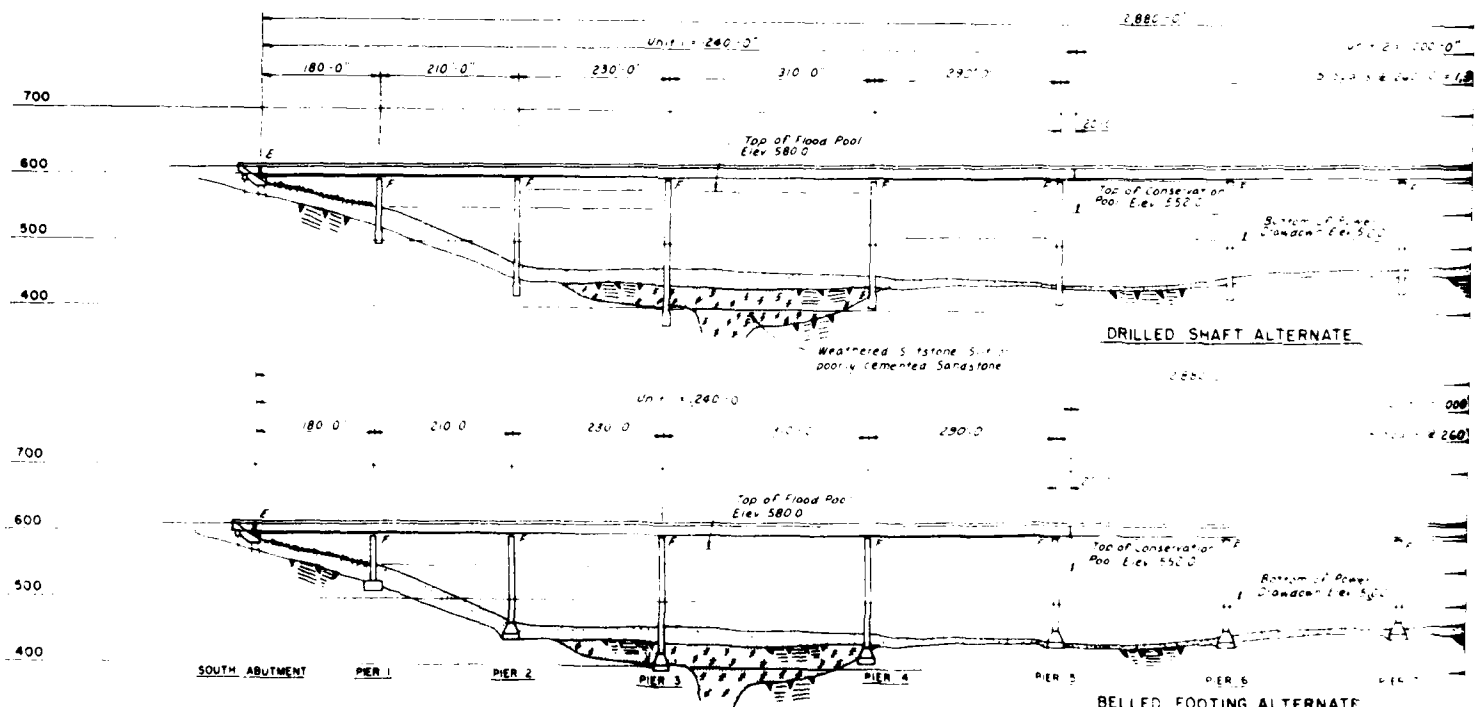


Power Pole to be relocated. Required by Arkansas State Highway and Transportation Department at no cost to the Contractor. See Specifications.

PLAN



PROFILE GRADE



DRILLED SHAFT ALTERNATE

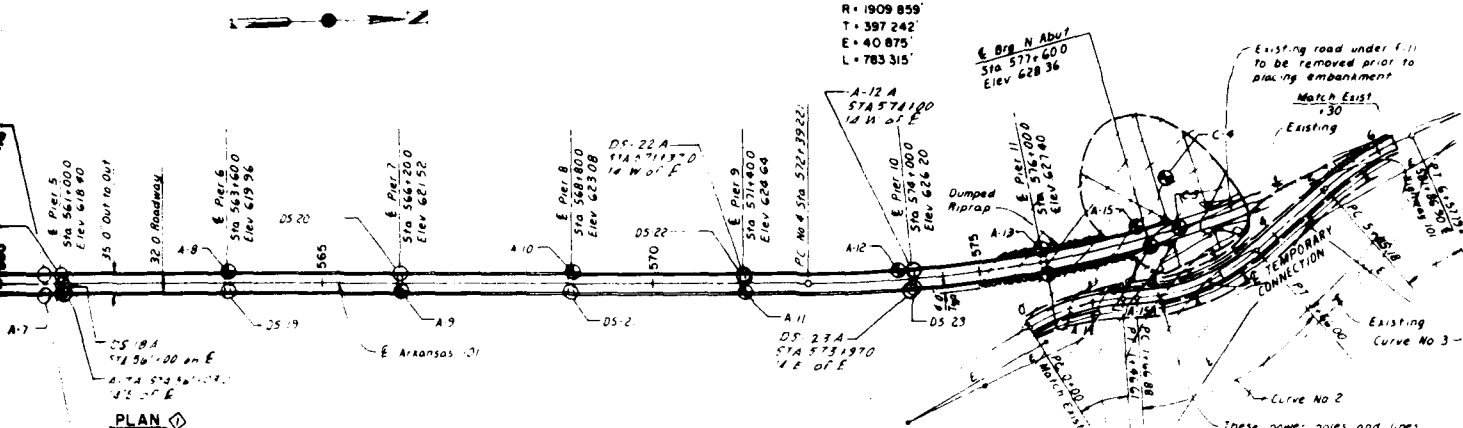


BELLED FOOTING ALTERNATE

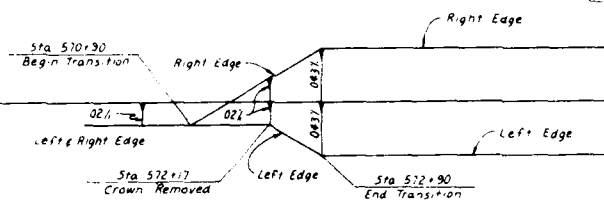
SCALE IN FEET

CURVE NO. 4

$\Delta = 23^\circ 29' 58''$
 $D = 3^\circ 00'$
 $R = 1909.859'$
 $T = 397.242'$
 $E = 40.875'$
 $L = 783.315'$



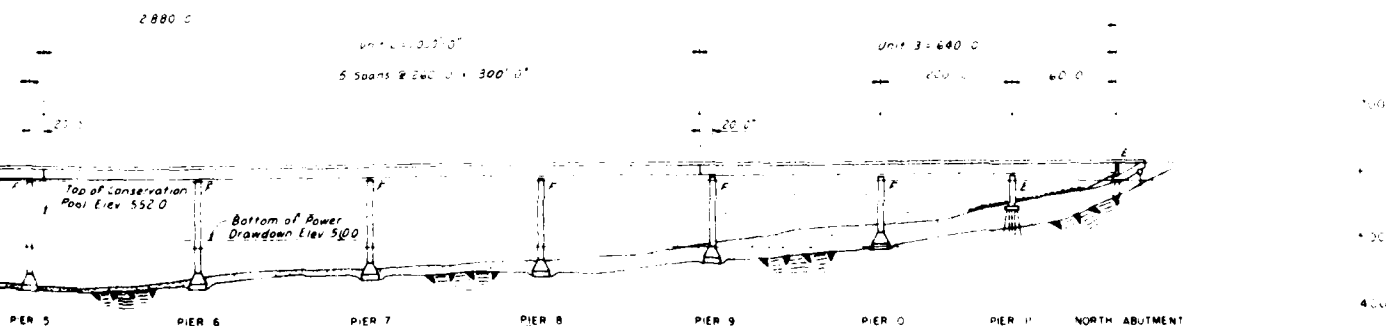
PROFILE GRADE



CURVE NO. 1
 TEMP CONN
 $PI = Sta 0+74.80$
 $\Delta = 28^\circ 00'$
 $R = 300.00'$
 $T = 74.80'$
 $E = 9.18'$
 $L = 146.61'$

CURVE NO. 2
 TEMP CONN
 $PI = Sta 2+70.27$
 $\Delta = 38^\circ 01' 47''$
 $R = 300.00'$
 $T = 103.39'$
 $E = 17.31'$
 $L = 199.12'$

DRILLED SHAFT ALTERNATE

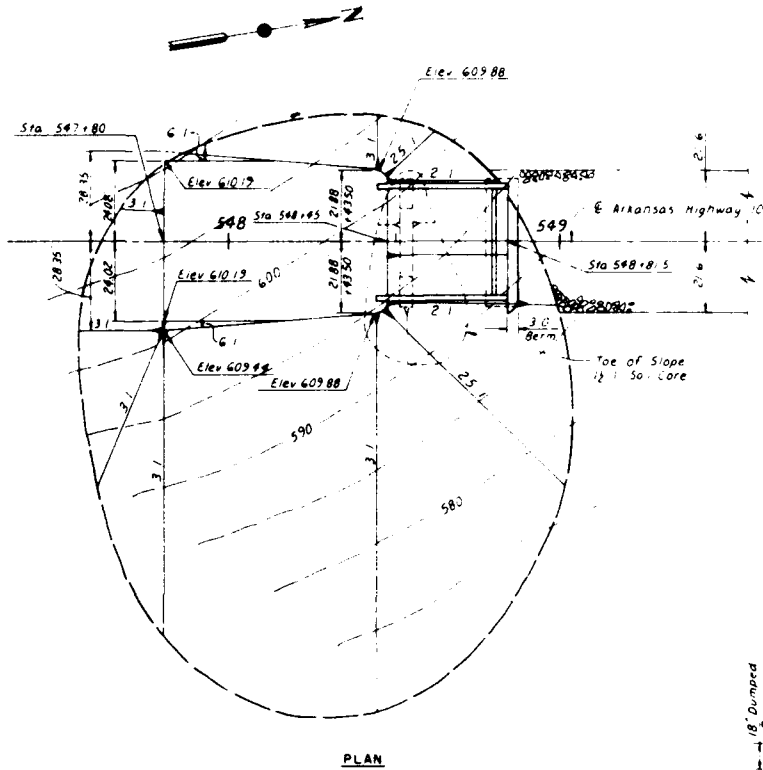


BELLED FOOTING ALTERNATE

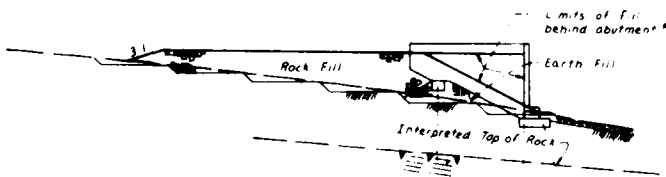


Notes:
 For details of temporary connection see Sheet 3
 For embankment and detail details see Sheet 28
 For limits of Contractors Work Areas see Sheet 2
 All surveying and laboratory and field test data
 from this project are included with the
 contract for this project.
 It is noted that the bridge should be included at ends of bridge
 to show bridge and be used from abutment to Elevation
 150' center line.

| | | | |
|------------------------------|--|--|--|
| HNTB | | U.S. ARMY ENGINEER DISTRICT LITTLE ROCK, ARKANSAS | |
| WHITE RIVER AND TERRITORIES | | NORTH FORK RIVER ARKANSAS | |
| NORFOLK LAKE HIGHWAY BRIDGES | | BAXTER COUNTY ARKANSAS | |
| SUBSTRUCTURE | | ARKANSAS HIGHWAY 101 | |
| GENERAL PLAN AND ELEVATION | | FEBRUARY 1970 | |
| DRAWN BY: [Signature] | | CHECKED BY: [Signature] | |
| SCALE: AS SHOWN | | DATE: 02-10-70 | |
| INCL 1 | | 2435-134/2727 | |
| AMEND NO 0003 | | | |

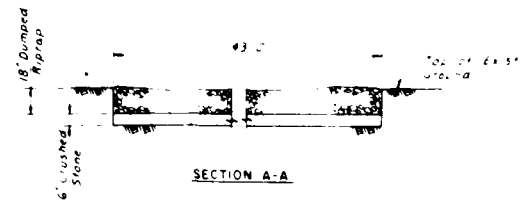


PLAN



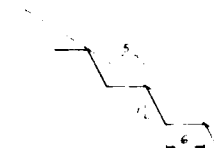
SECTION ALONG E ARKANSAS HIGHWAY 101

SOUTH APPROACH EMBANKMENT

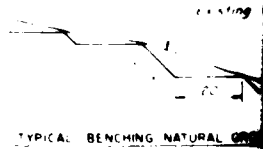


SECTION A-A

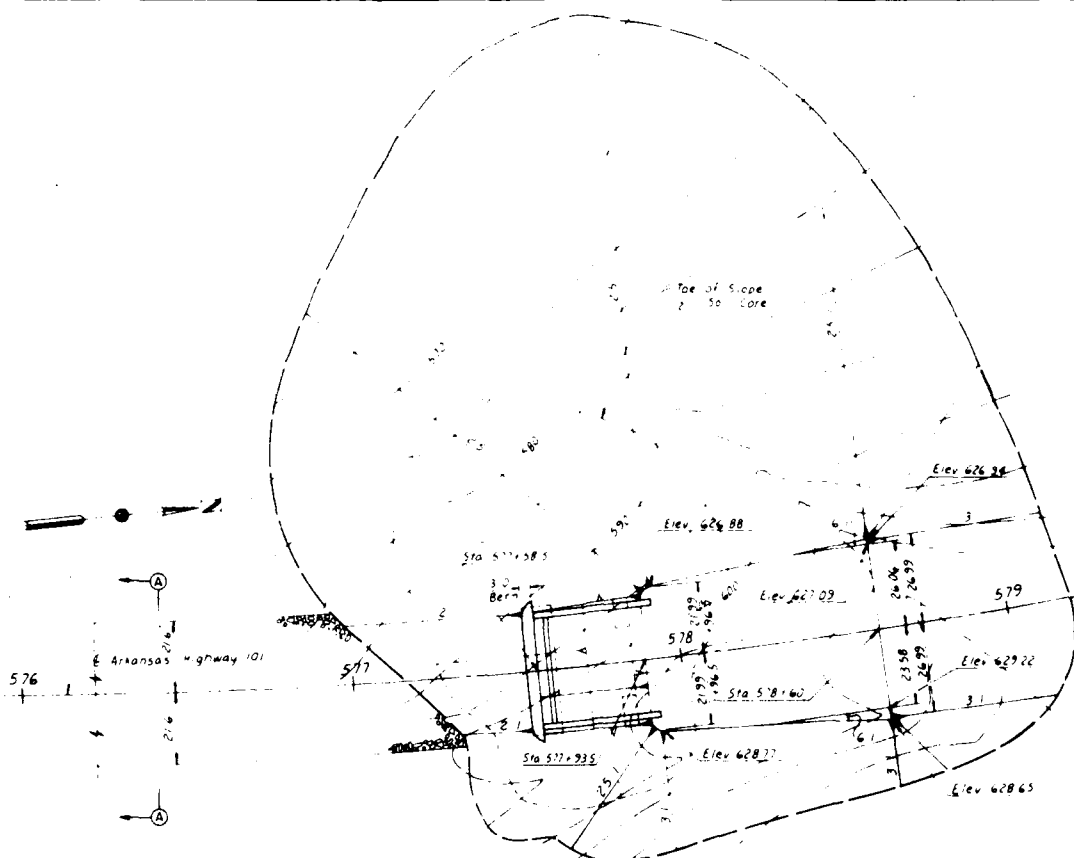
*Note: Fill behind abutments shall be placed after abutments are completed. Fill material may be either earth or rock, but both except material adjacent to walls must be Non-shrink Backfill as shown on abutment drawings. The cost of furnishing and placing fill behind abutments shall be considered incidental to and included with the price bid for Unexcavated Excavation Abutments.



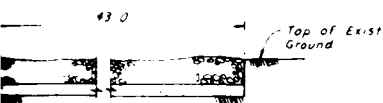
TYPICAL KEYING SOIL CORE



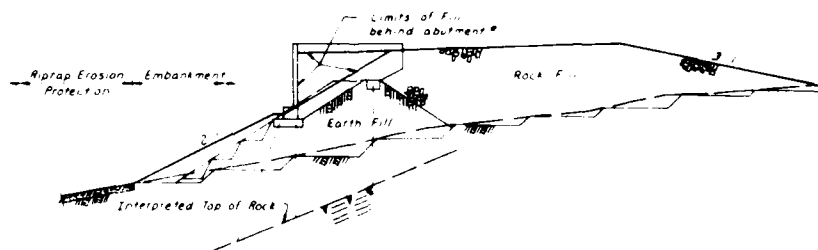
TYPICAL BENCHING NATURAL GROUND



PLAN

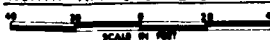


SECTION A-A

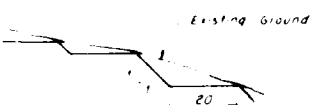


SECTION ALONG S. ARKANSAS HIGHWAY 101

NORTH APPROACH EMBANKMENT



Fill behind abutments shall be placed after abutments completed. Fill material may be either earth or rock or except material adjacent to walls must be Noncohesive fill as shown on abutment drawings. The cost of filling and placing fill behind abutments shall be itemized incidental to and included with the price of Unclassified Excavation Abutments.



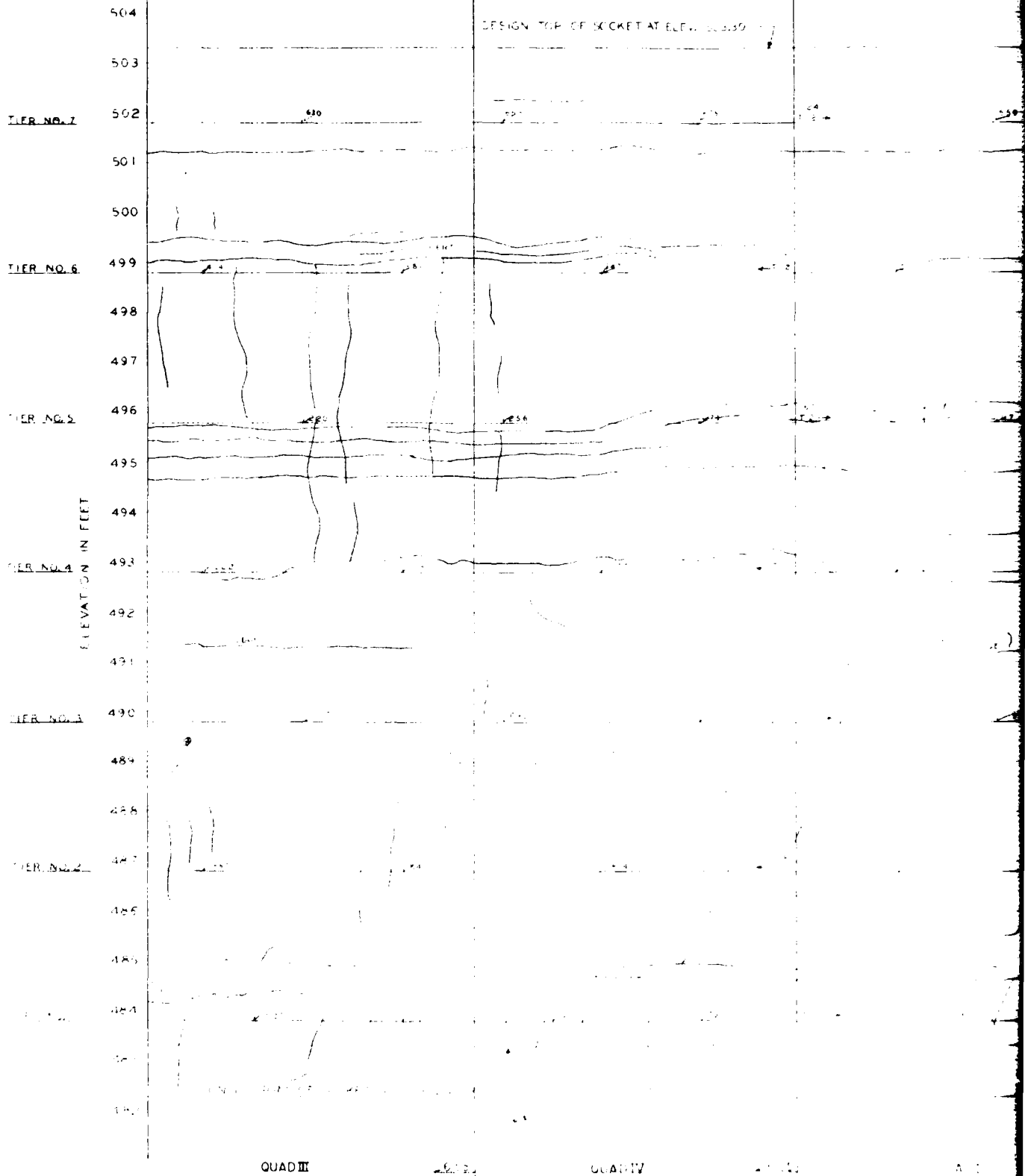
TYPICAL BENCHING NATURAL GROUND

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| HNTB HNTB CONSULTING ENGINEERS & ARCHITECTS 600 J. W. P. BLVD. 910 NWL 1111 1111 | | U.S. ARMY ENGINEER DISTRICT LITTLE ROCK, ARKANSAS NORTH FORK RIVER, ARKANSAS NORFOLK LAKE HIGHWAY BRIDGES DARTON COUNTY, ARKANSAS SUBSTRUCTURE ARKANSAS HIGHWAY 101 EMBANKMENT DETAILS | |
| DATE: 11/1/52 DRAWN BY: [Signature] CHECKED BY: [Signature] APPROVED BY: [Signature] | | FEBRUARY 1970 SCALE: 1" = 20' HORIZ. 1" = 10' VERT. -5- 8435-134/2728 | |

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WORK SAFETY



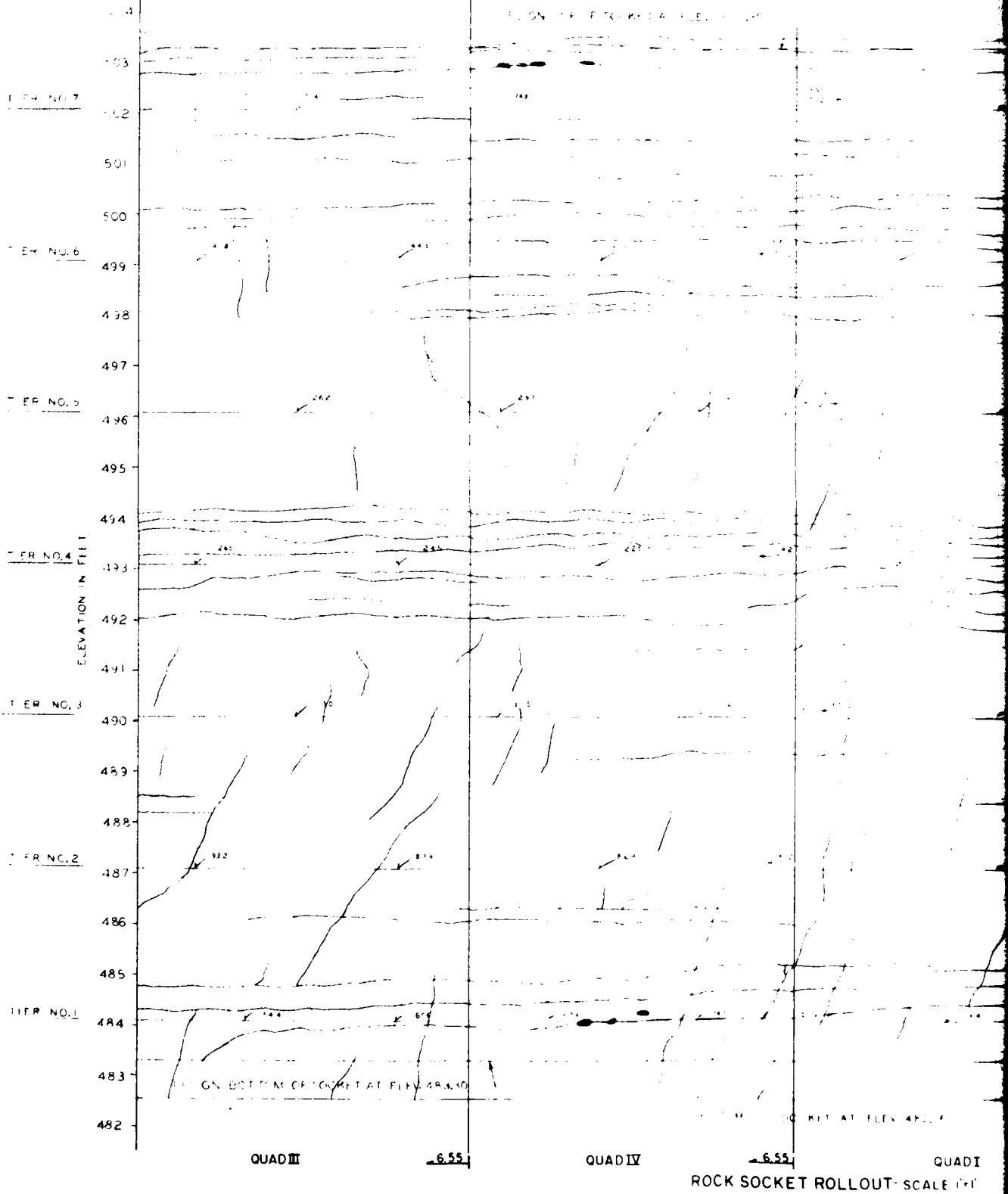
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SCALE _____ DRAWING NUMBER _____
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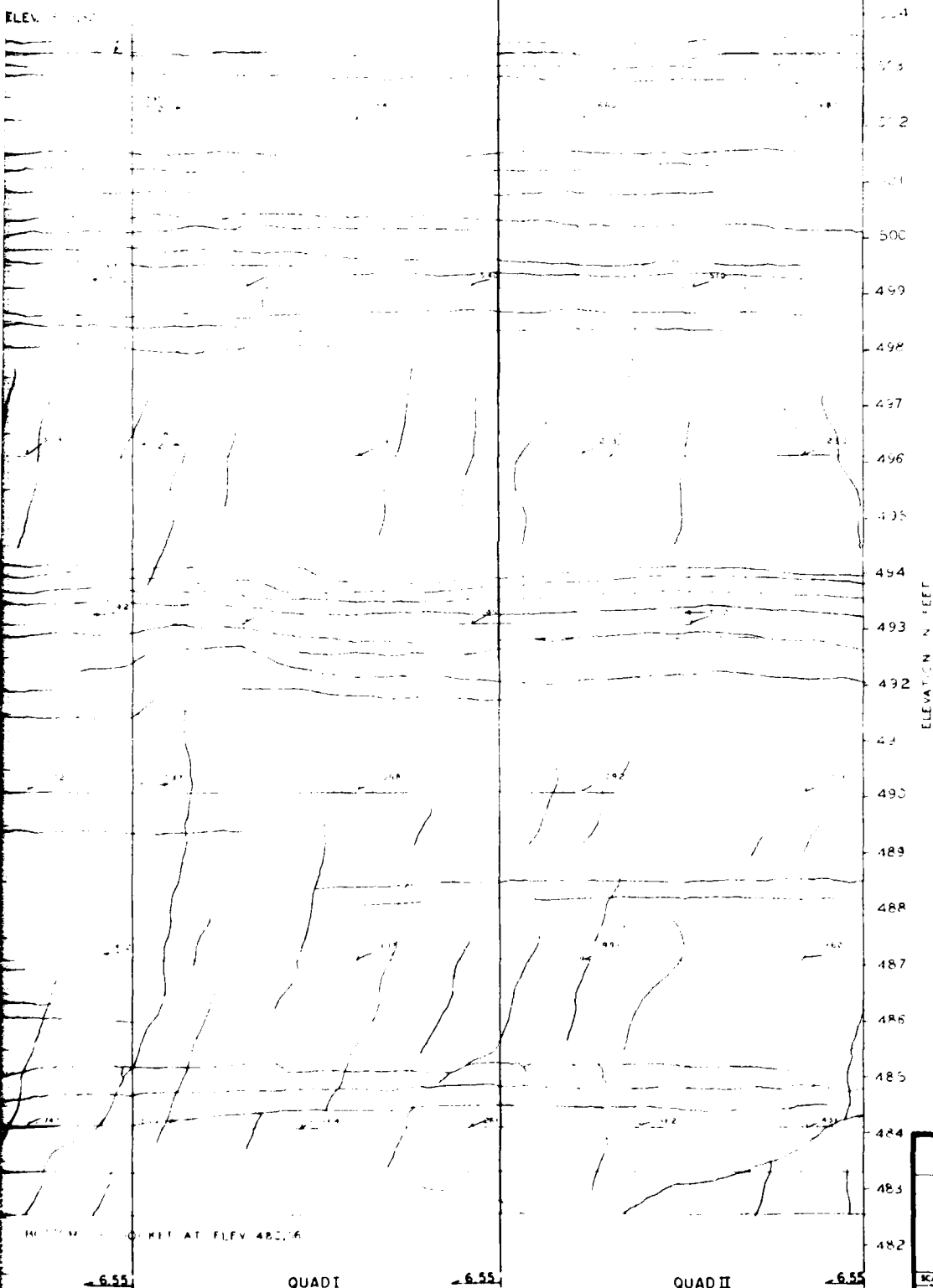
| FINAL | REVISION | DATE | BY | CHK |
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WORK SAFELY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATION
TOP OF EXISTING PIER
TOP OF EXISTING PIER
TOP OF EXISTING PIER

INSPECTION OF SOCKET PIER, SHOWS:
SOUTH SIDE ROCK BOTTOM WITH SALT
OCCASIONAL SALT AND ROCK FRAGMENTS

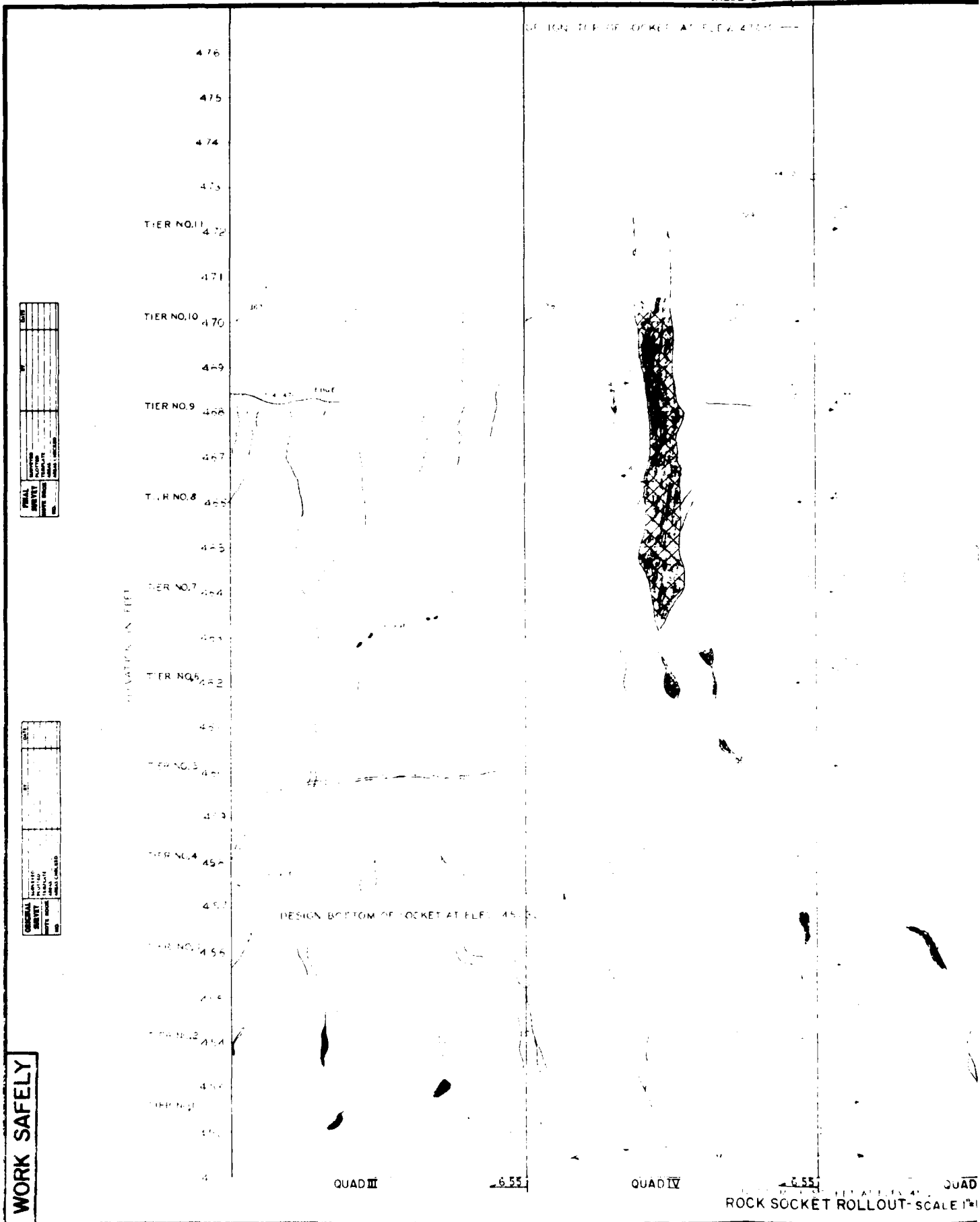
INSPECTION OF SOCKET PIER, SHOWS:
SOUTH SIDE ROCK BOTTOM WITH SALT
OCCASIONAL SALT AND ROCK FRAGMENTS

DATE OF INSPECTION: 10/1/61
BY: J. M. LACROIX, JR.
CONTRACTOR: MANSFIELD CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CORTLANDT

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 62 PIER 2 SOUTH SOCKET

| | |
|--------------|-----------------------------|
| SCALE: 1"=1' | DRAWING NUMBER: 01-111-10-1 |
| SPEC NO: 101 | DATE: 10/1/61 |
| SHEET 1 OF 1 | |



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REFERENCE ELEVATIONS

TOP OF MAIN TANK L. 45.72
TOP OF FOOT L. 45.71
BOTTOM OF SOCKET L. 45.65

EXPLANATION SEE SHEET NO. 1
DAS NO. 487145-22

VERTICAL SCALE IN FEET

1" = 10' HORIZONTAL SCALE

STATIONING
DISTANCE FROM
NORFOLK LAKE BRIDGE

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| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFOLK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| DRAWING NUMBER | |
| SCALE | DRAWING NUMBER |
| SPEC. NO. | |
| DATE | |
| BY | SHEET OF |

6.55
ROCK SOCKET ROLLOUT-SCALE 1/4"

6.55

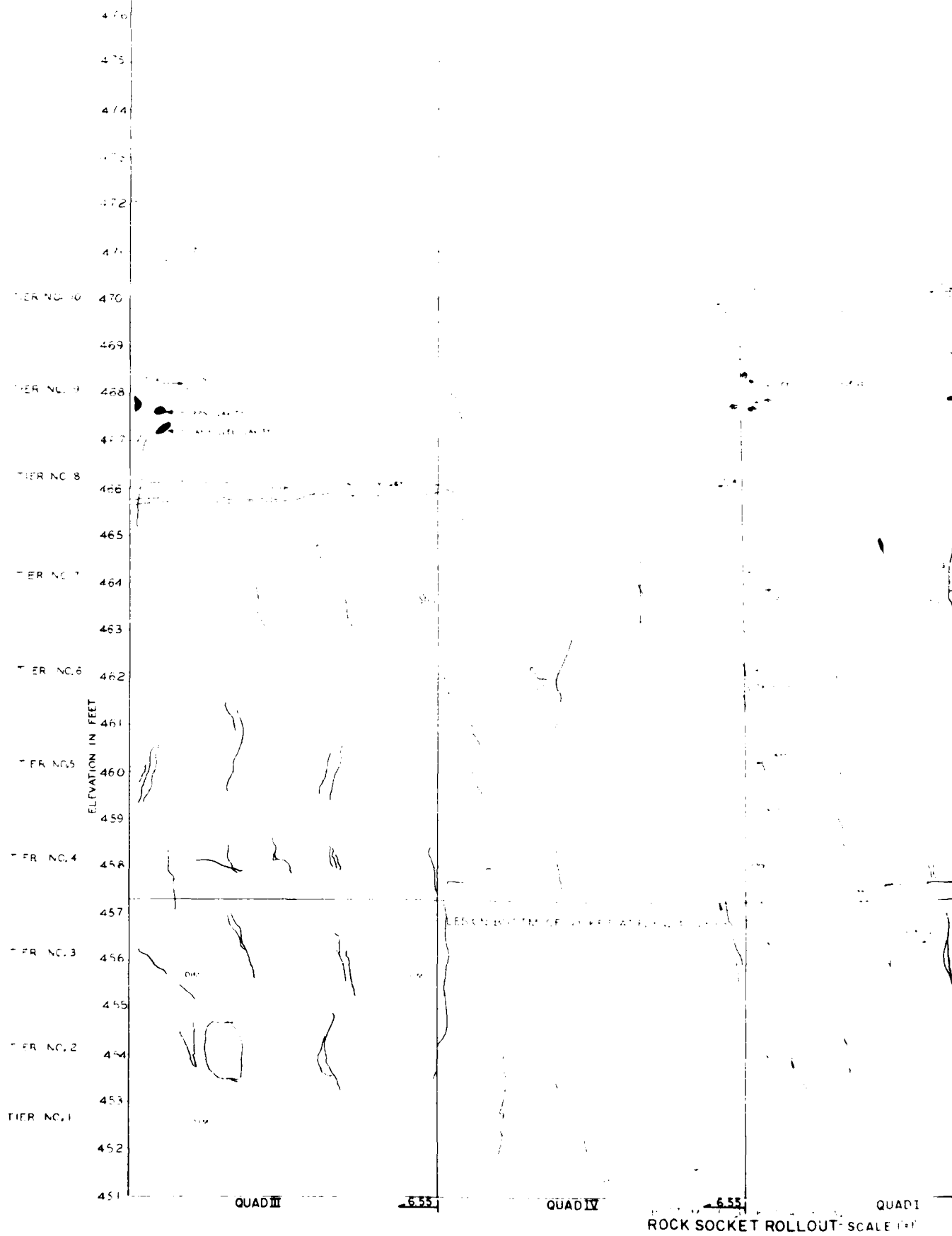
QUAD II

6.55

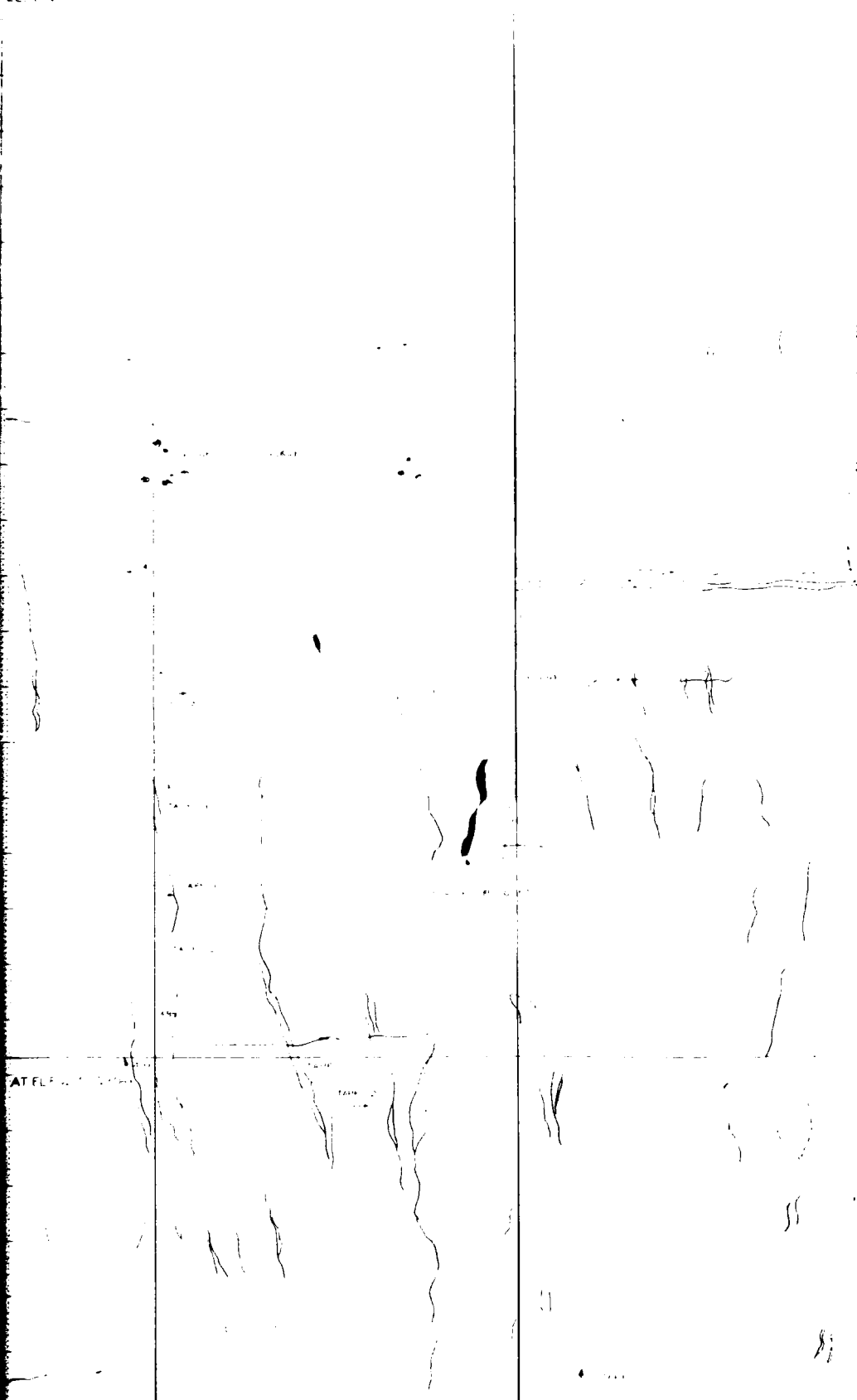
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| FINAL SURVEY | SUPPLEMENTED PLOTTED TEMPERATURE AREAS AREAS UNCLE | 90 | DATE |
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[illegible]

WORK SAFELY



EC-114



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REFERENCE ELEVATIONS

TOP OF RAILROAD TRACK 474.4
TOP OF SOCKET 473.1
BOTTOM OF SOCKET 471.1

EXPLANATION: SEE SHEET NO. 1

1. RAILROAD TRACK 474.4

ELEVATION IN FEET

INSPECTION OF SOCKET FLOOR, SHOWING
SLIGHTLY RISE BOTTOM

DATE OF INSPECTION: JULY 10, 1964
INSPECTOR: L. J. BROWN, JR.
CONTRACTOR: GASTON CONSTRUCTION CO.
INSPECTING GEOLOGIST: CHAS. BROWN

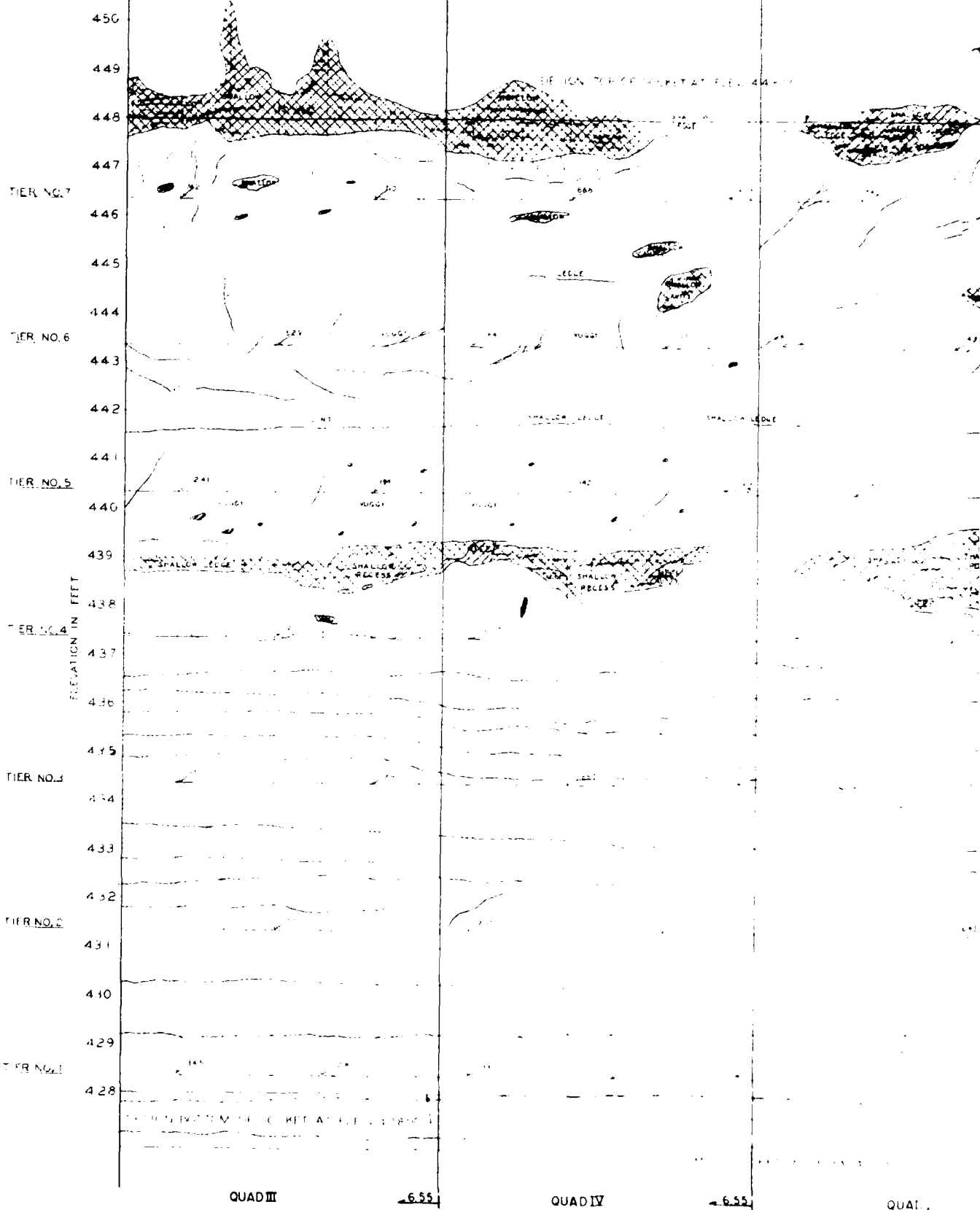
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 62-11 BR 3 SOUTH SOCKET

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| SCALE: 1"=10' | DRAWING NUMBER: 9687-1347-3025 |
| SPEC. NO. | DATE: AUG. 1964 |
| SHEET 3 OF 5 | |

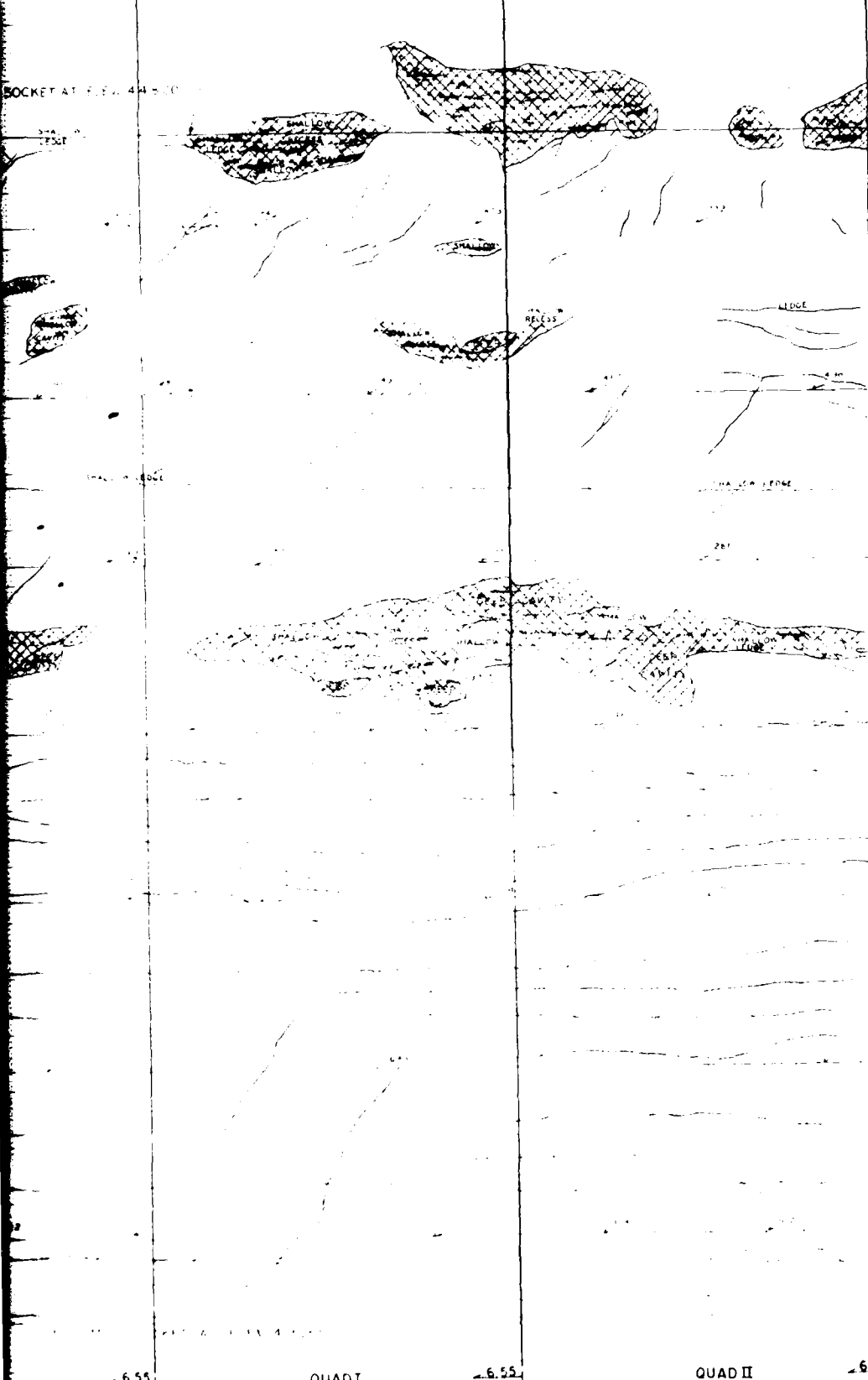
QUAD I
ROCK SOCKET ROLLOUT-SCALE 1"=10'

QUAD II



WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS
 TOP OF TURN TABLE = 448.4
 TOP OF SOCKET = 448.00
 BOTTOM OF SOCKET = 426.85

EXPLANATION, SEE SHEET NO. 6
 (WGS. NO. 3687-13473022)

NOTATION: F. SOCKET ELEV. SHOWN
 A VERY SLIGHTLY LOWER ELEVATION

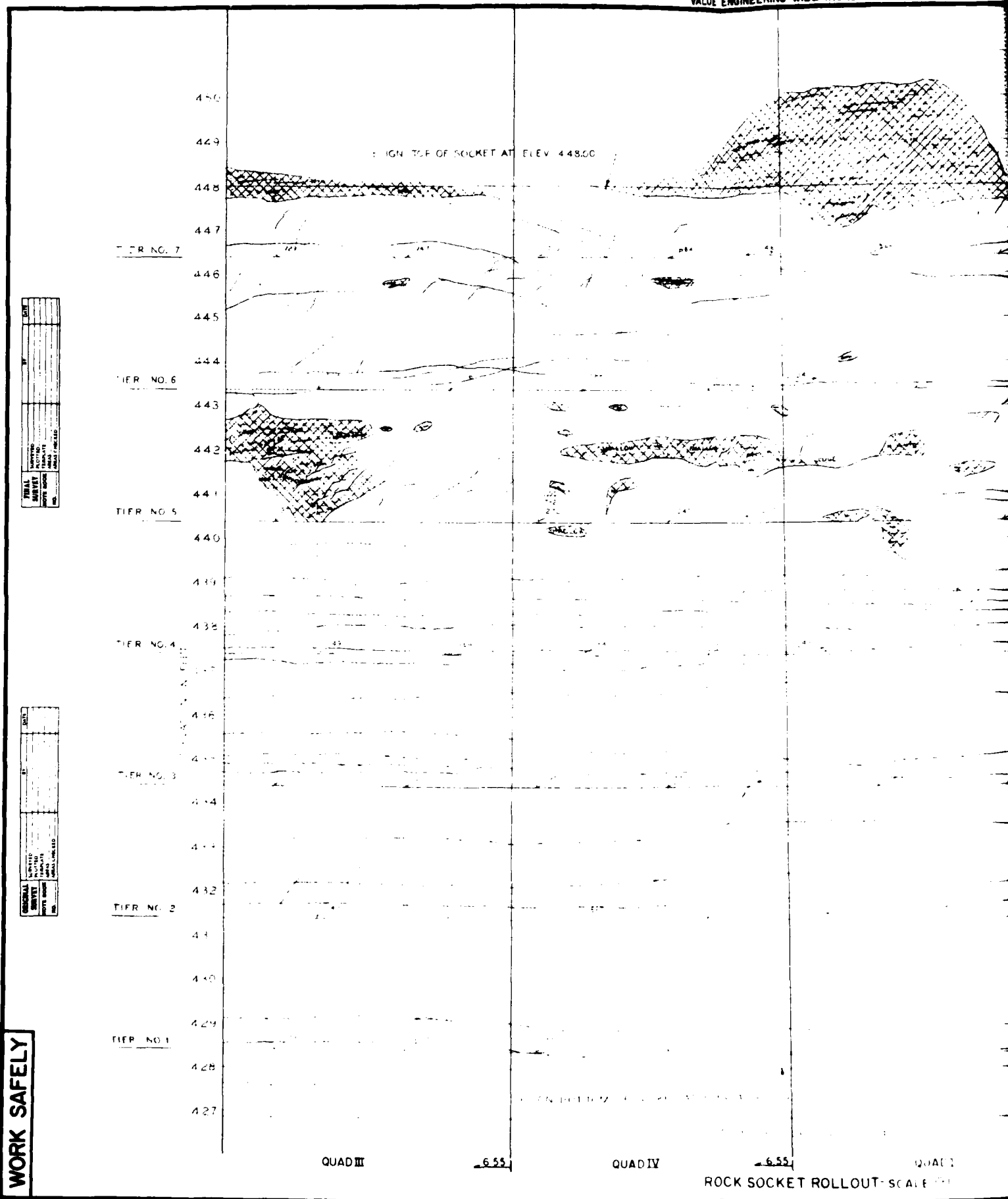
ATTN: INSPECTOR, L. J. L. R.
 CONTRACT NO. DA-W-217-61-0005
 CONTRACTOR: BARRON, L. J. L. R.
 INSPECTOR: L. J. L. R.

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

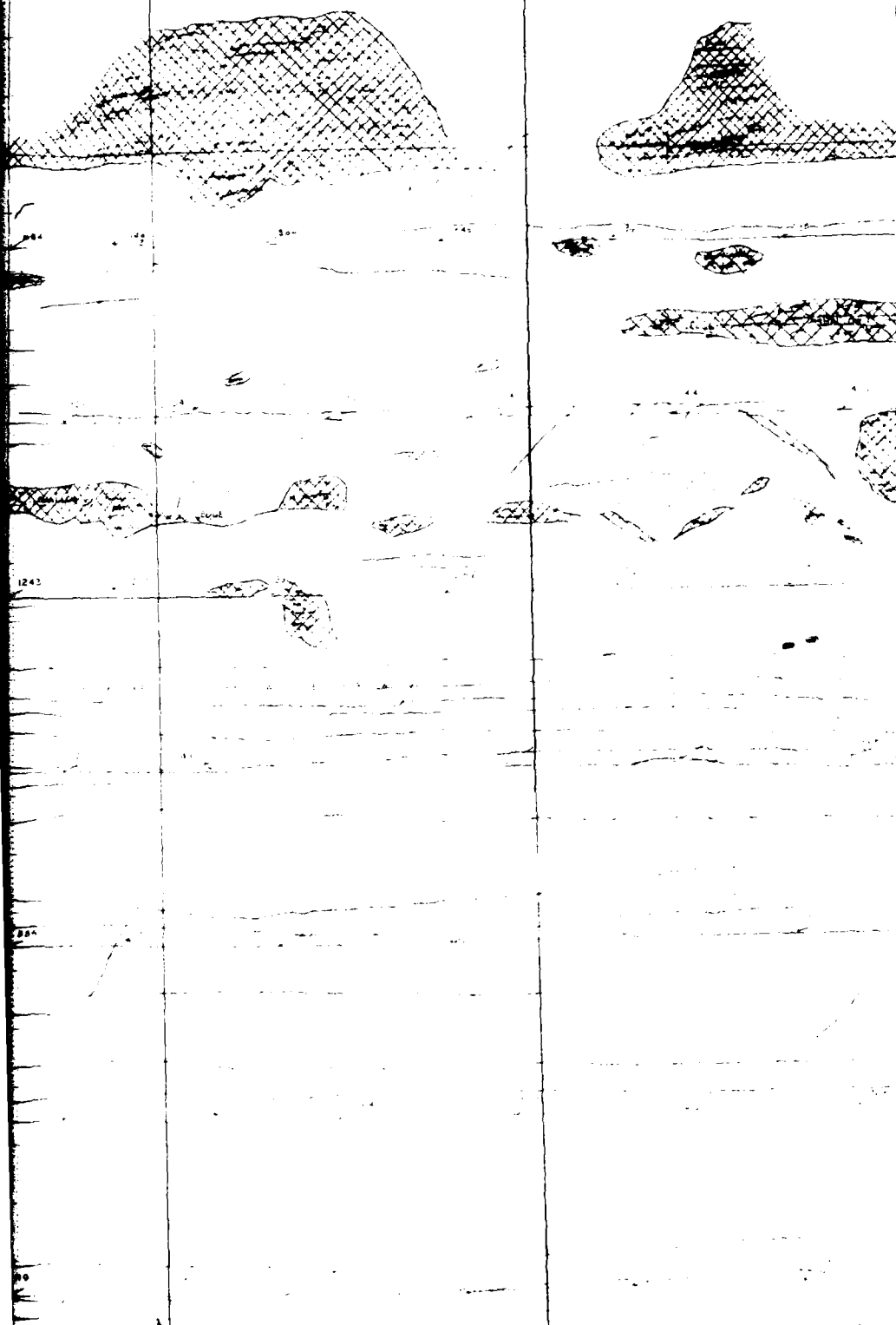
NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
 HWY. 42, BRIDGE 4, NORTH SIDE

SCALE: 1" = 100' DRAWING NUMBER
 SPC. NO. 13473022
 DATE: 10/1/54
 SHEET 1 OF 1

6.55 QUAD I 6.55 QUAD II 6.55
 ROCK SOCKET ROLLOUT-SCALE 1:1



VALUE ENGINEERING WILL INCREASE YOUR PROFIT



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REFERENCE ELEVATIONS
TOP OF TURN-TABLE = 448.0
TOP OF SOCKET = 448.0
BOTTOM OF SOCKET = 446.87

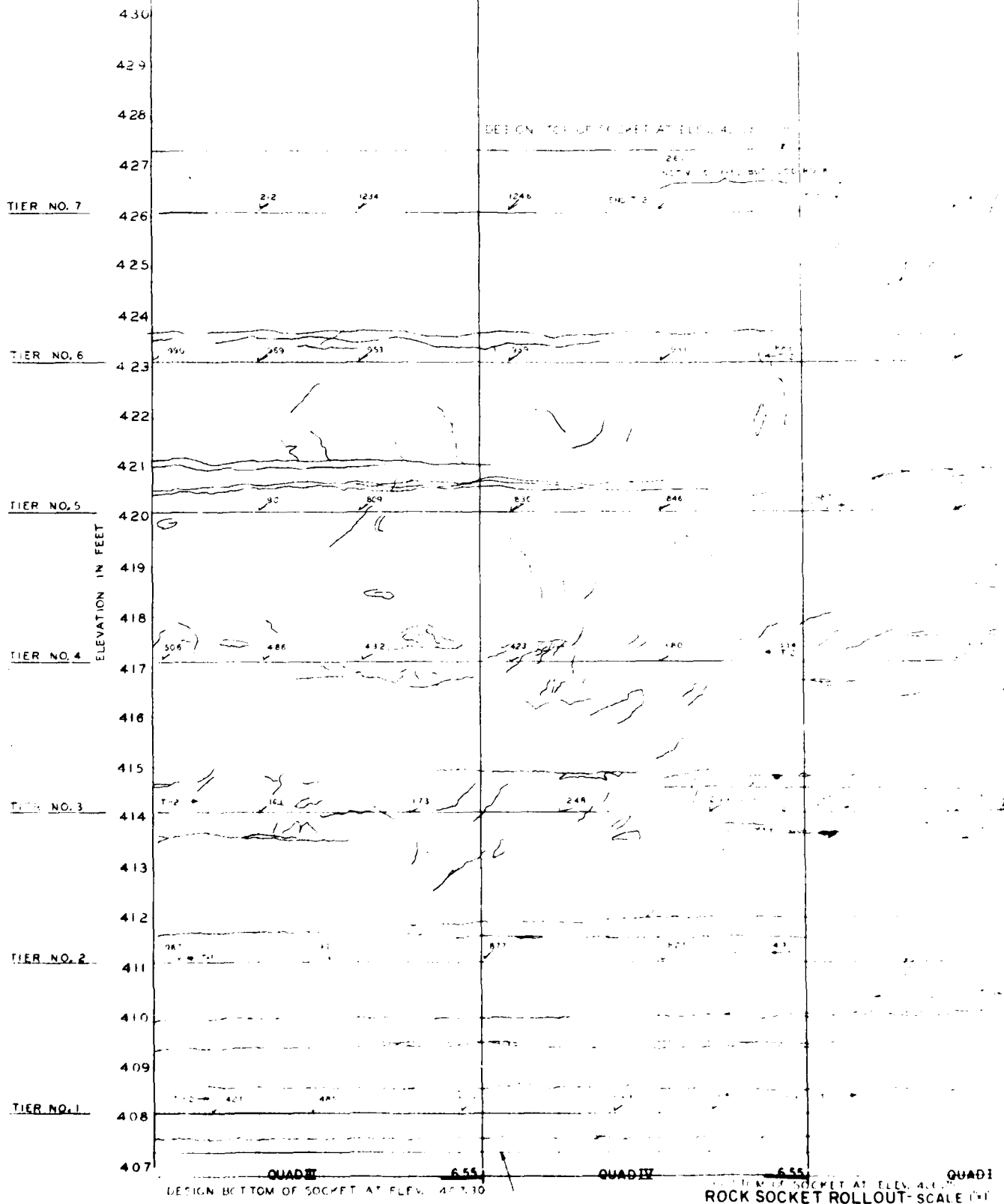
EXPLANATION OF SHEET NO. 1
(OWNERS PROPERTY)

NOTES: 1. ALL ELEVATIONS ARE IN FEET.
2. SEE SHEET NO. 2 FOR PLAN VIEW.
3. ALL DIMENSIONS ARE IN FEET.
4. ALL DIMENSIONS ARE TO CENTER OF TURN-TABLE.

APPROVED: [Signature]
SUPERVISOR, LITTLE ROCK DISTRICT
NORFOLK BRIDGE, LITTLE ROCK, ARK.
DATE: [Date]

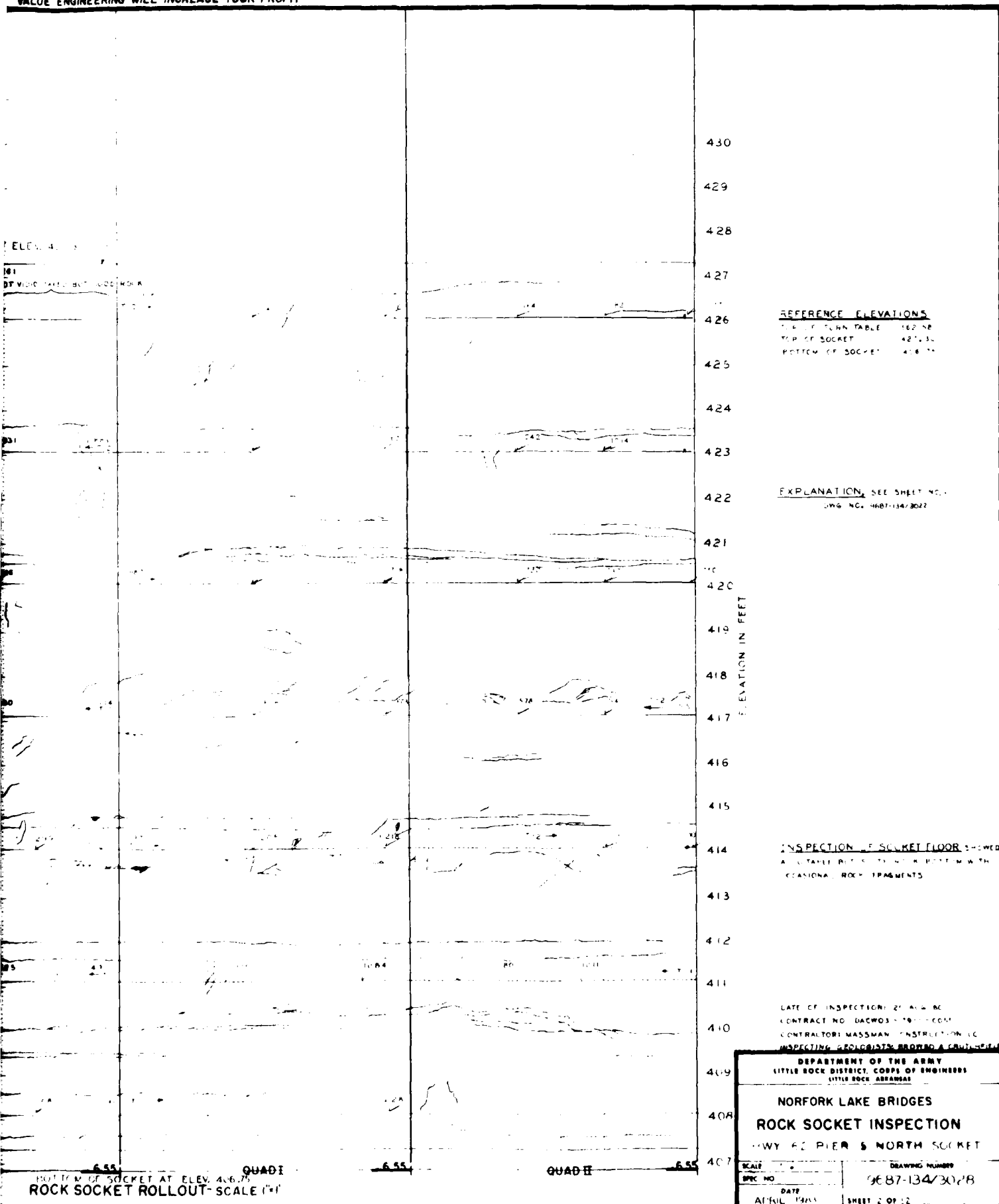
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|--|-------------------------------|
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT CORPS OF ENGINEERS LITTLE ROCK, ARK. | |
| NORFOLK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| (OWNERS PROPERTY) | |
| SCALE: 1"=100' | DRAWING NUMBER: 4687-1-17-102 |
| SPEC. NO.: | DATE: |
| SHEET 1 OF 1 | |

6.55 QUAD I 6.55 QUAD II 6.55
ROCK SOCKET ROLLOUT- SCALE 1"=100'



WORK SAFELY

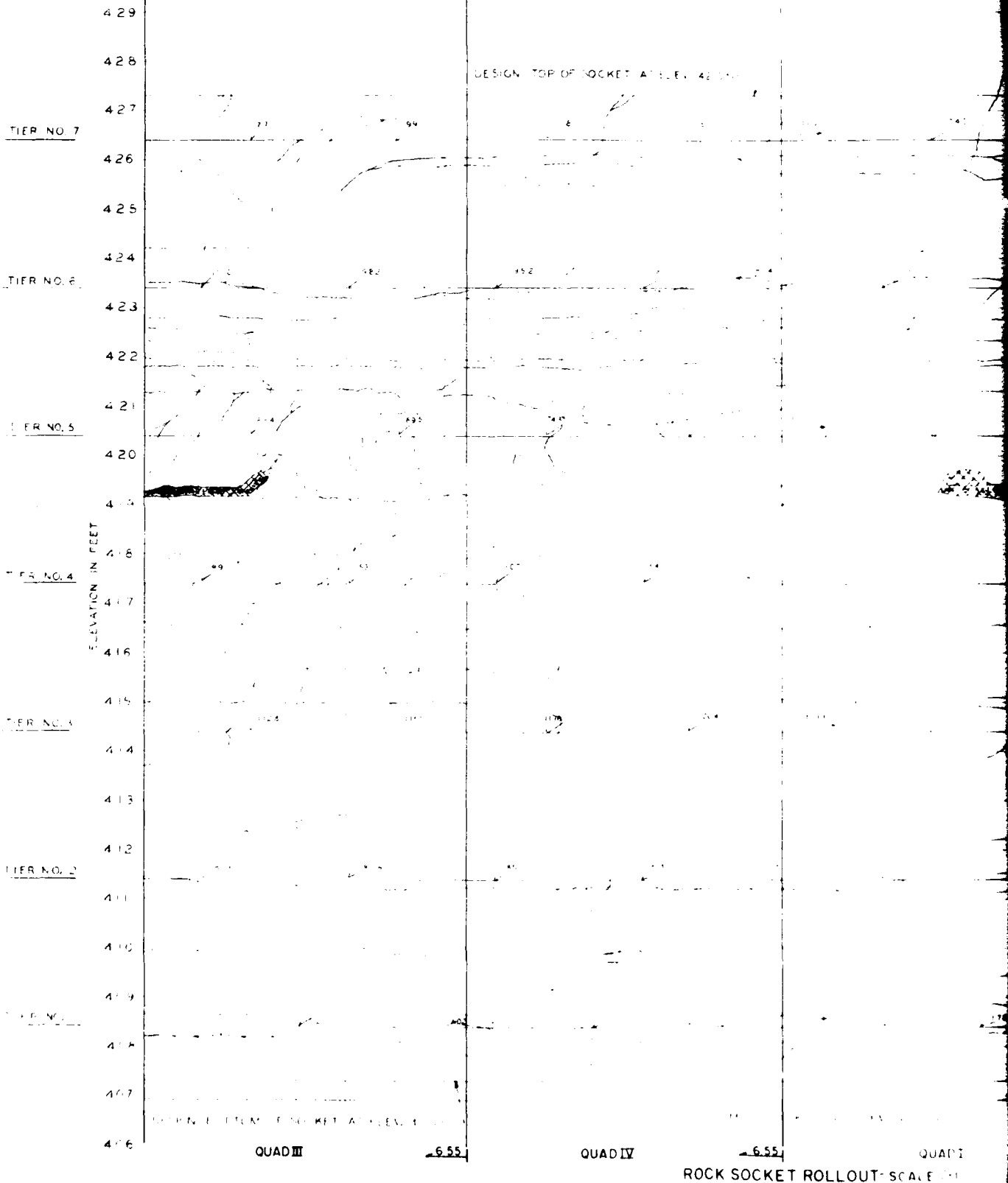
VALUE ENGINEERING WILL INCREASE YOUR PROFIT

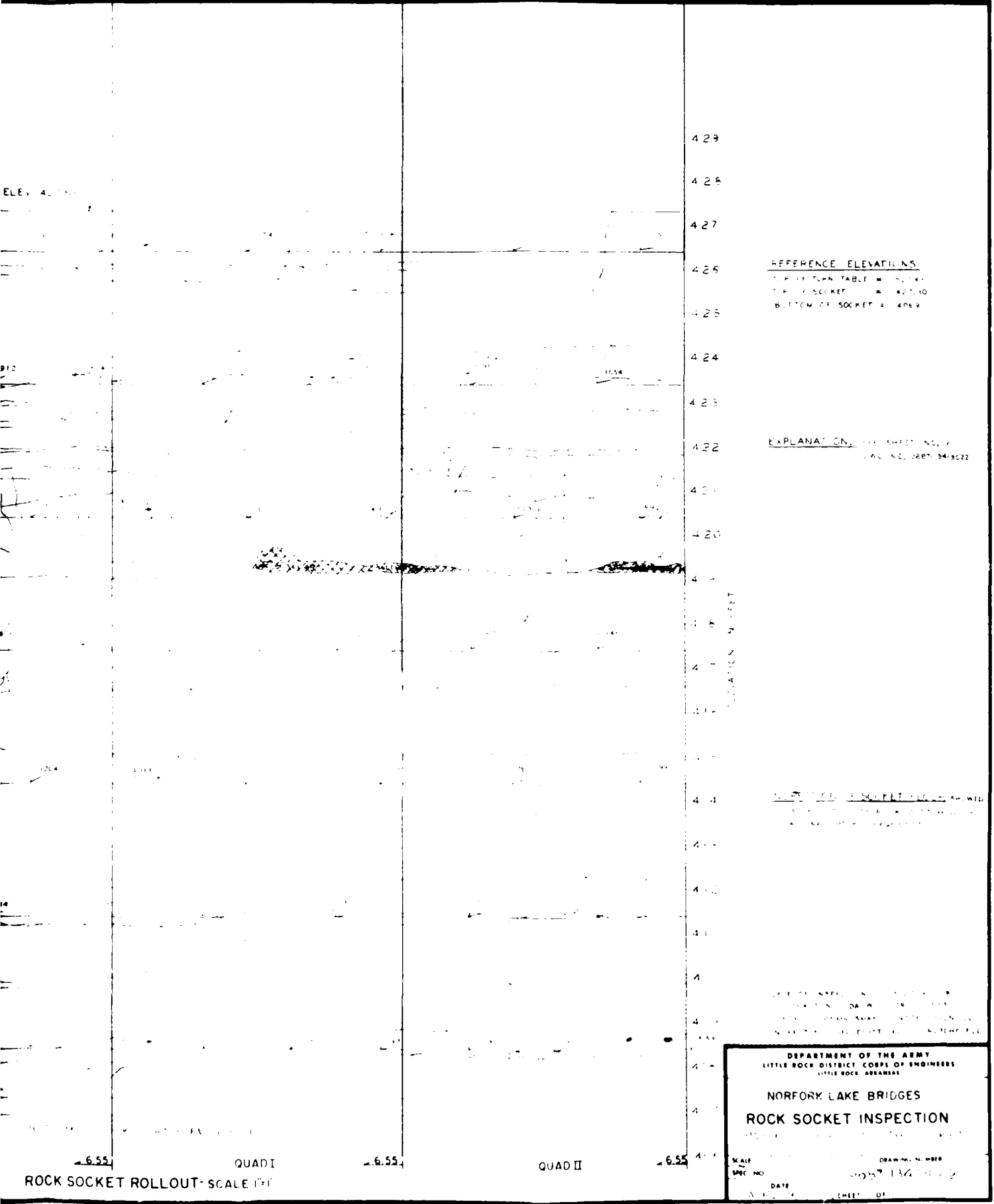


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WORK SAFELY

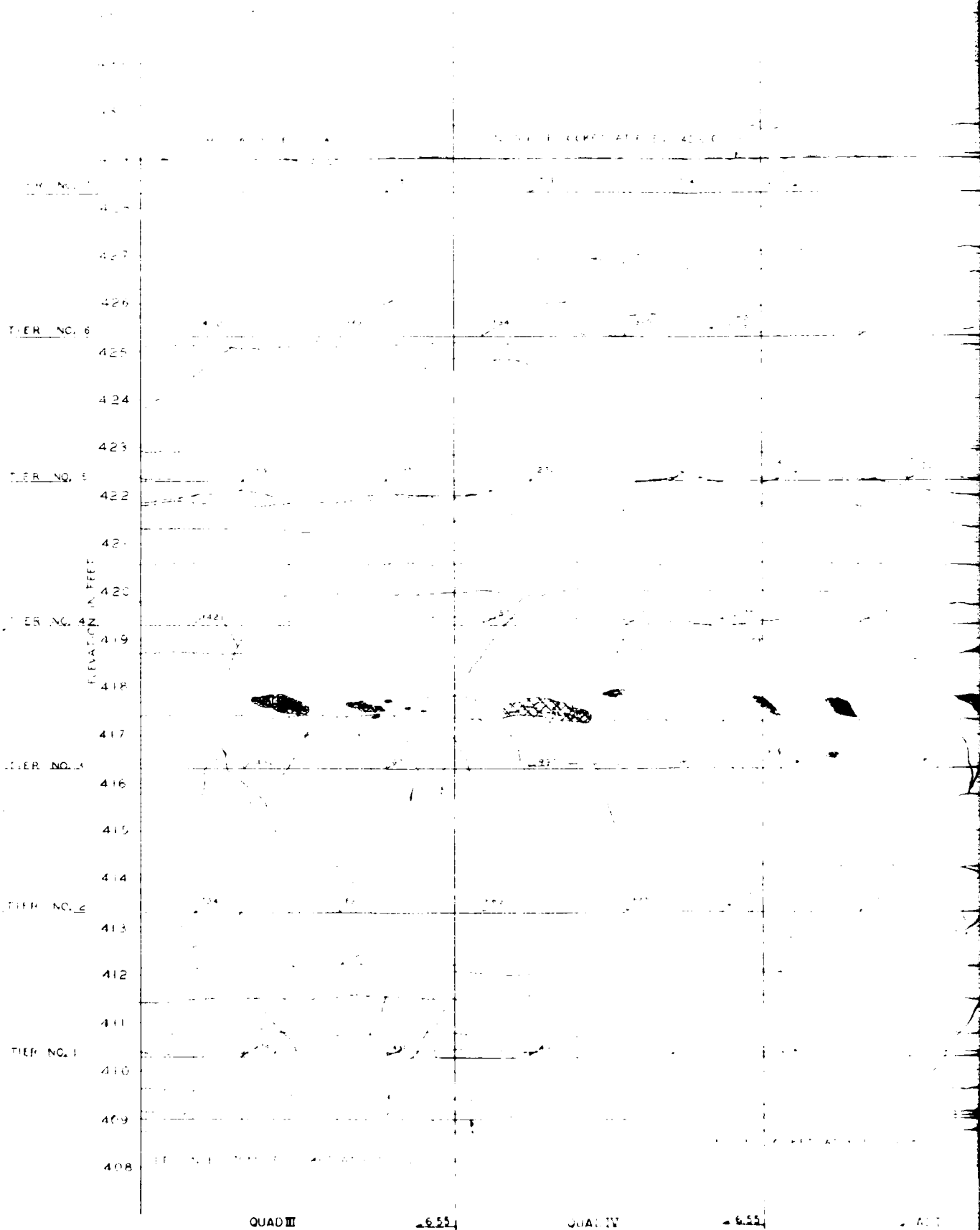




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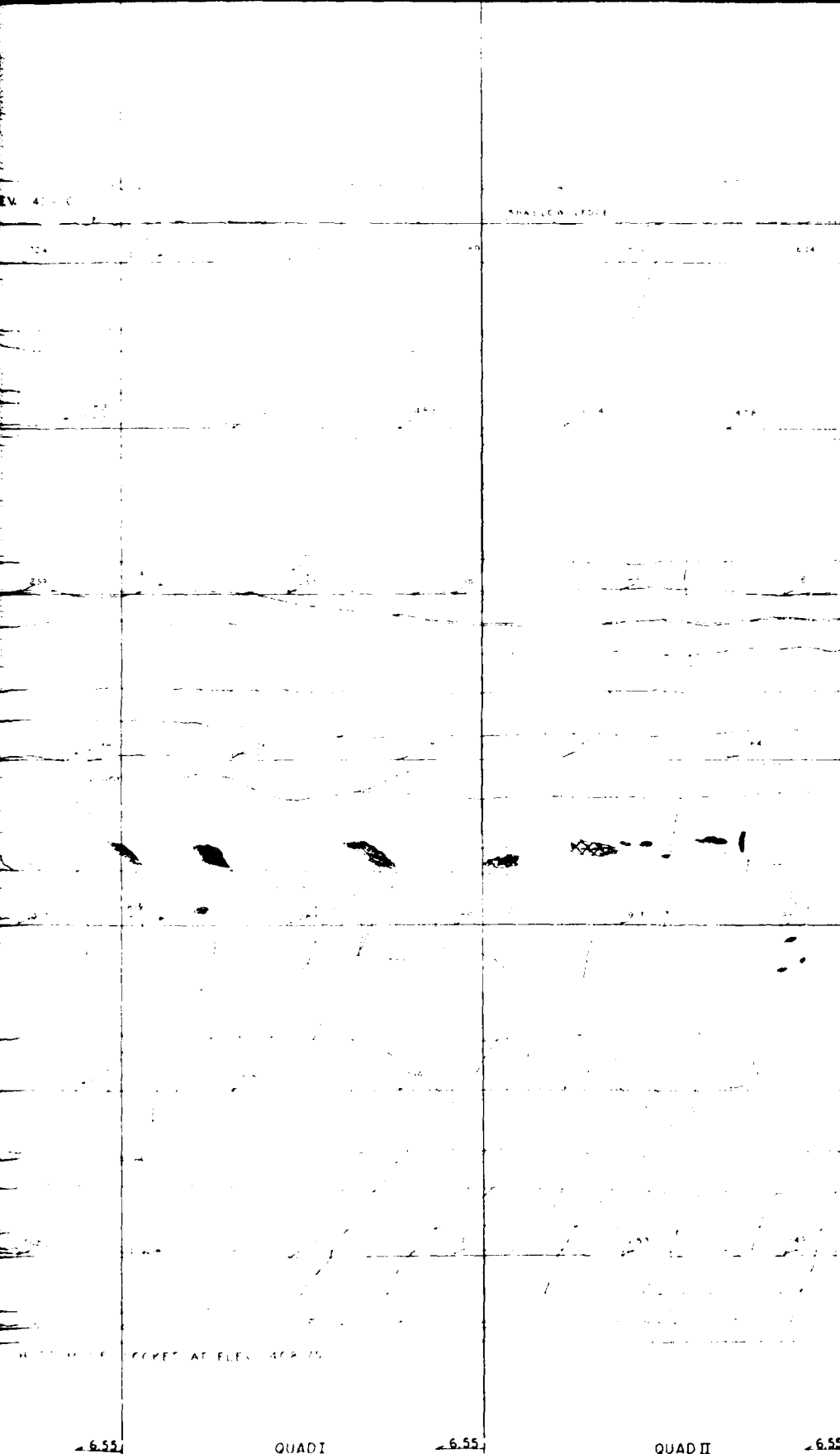
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WORK SAFELY



ROCK SOCKET ROLLOUT SCALE

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS
TOP OF SHALLOW LEDGE = 424.0
TOP OF ROCK SOCKET = 424.0
BOTTOM OF SOCKET = 408.0

EXPLANATION: SEE SHEET NO. 1
THIS SHEET MAPS OUT

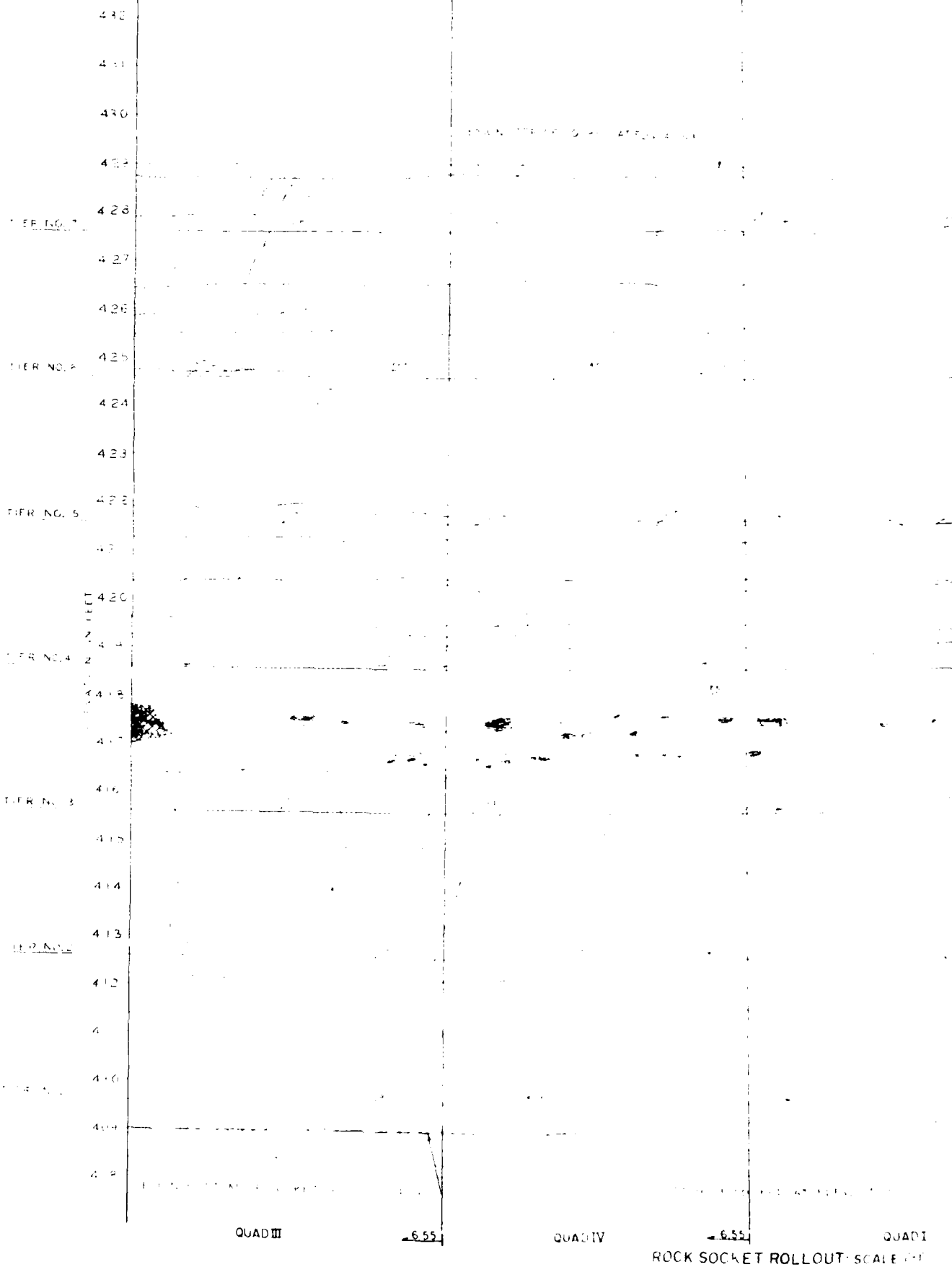
INSPECTION OF SOCKET FILLER SHOWN
A GOOD SOLE ROCK BOTTOM WITH
Occasional small sand and rock fragments
along the base of the socket walls.

INSPECTION ON 11/14/1955
CONTRACT NO. DA AGC 19-1-1255
CONTRACTOR NORMAN CONTRACTING CO.
INSPECTING AGENT: ROY L. HUGHES

| | |
|---|-----------------------------------|
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT, CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFORK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| CONTRACT NO. DA AGC 19-1-1255 | |
| SCALE 1"=100' | DRAWING NUMBER 96-57-1-447-030 |
| DATE 11/14/55 | SHEET 4 OF 4 |

6.55 QUAD I 6.55 QUAD II 6.55
ROCK SOCKET ROLLOUT SCALE 1"=100'

WORK SAFELY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT

AT ELEVATION

422

421

420

429

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REFERENCE ELEVATION
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STANDARD ELEVATION
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INSPECTION OF ROCK SOCKETS
STANDARD ELEVATION
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STANDARD ELEVATION
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DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION

AT ELEVATION

SCALE
SPEC NO
DATE
DRAWING NUMBER
1567 134
SHEET OF 12

ROCK SOCKET ROLLOUT-SCALE 1/4"

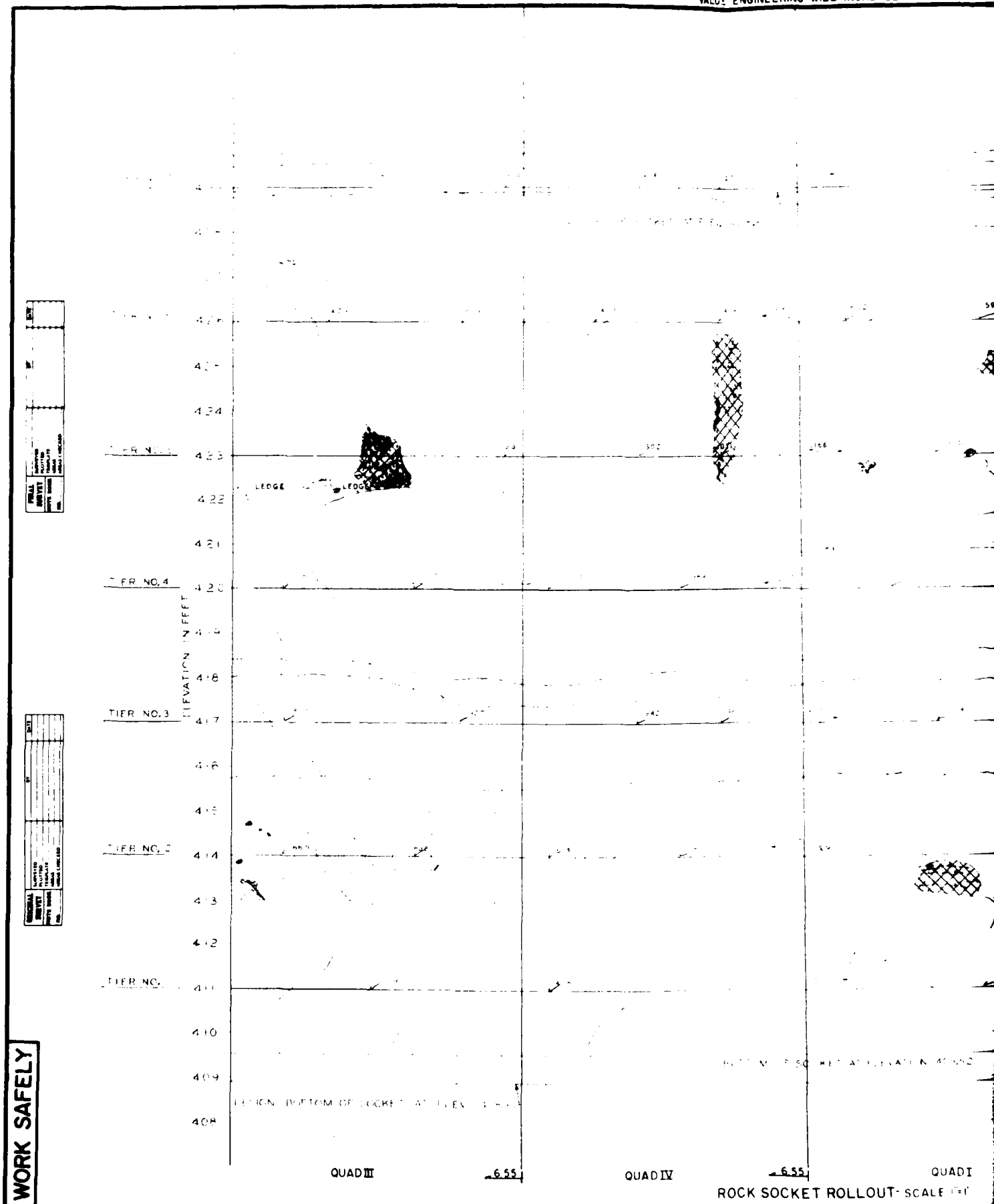
QUAD I

QUAD II

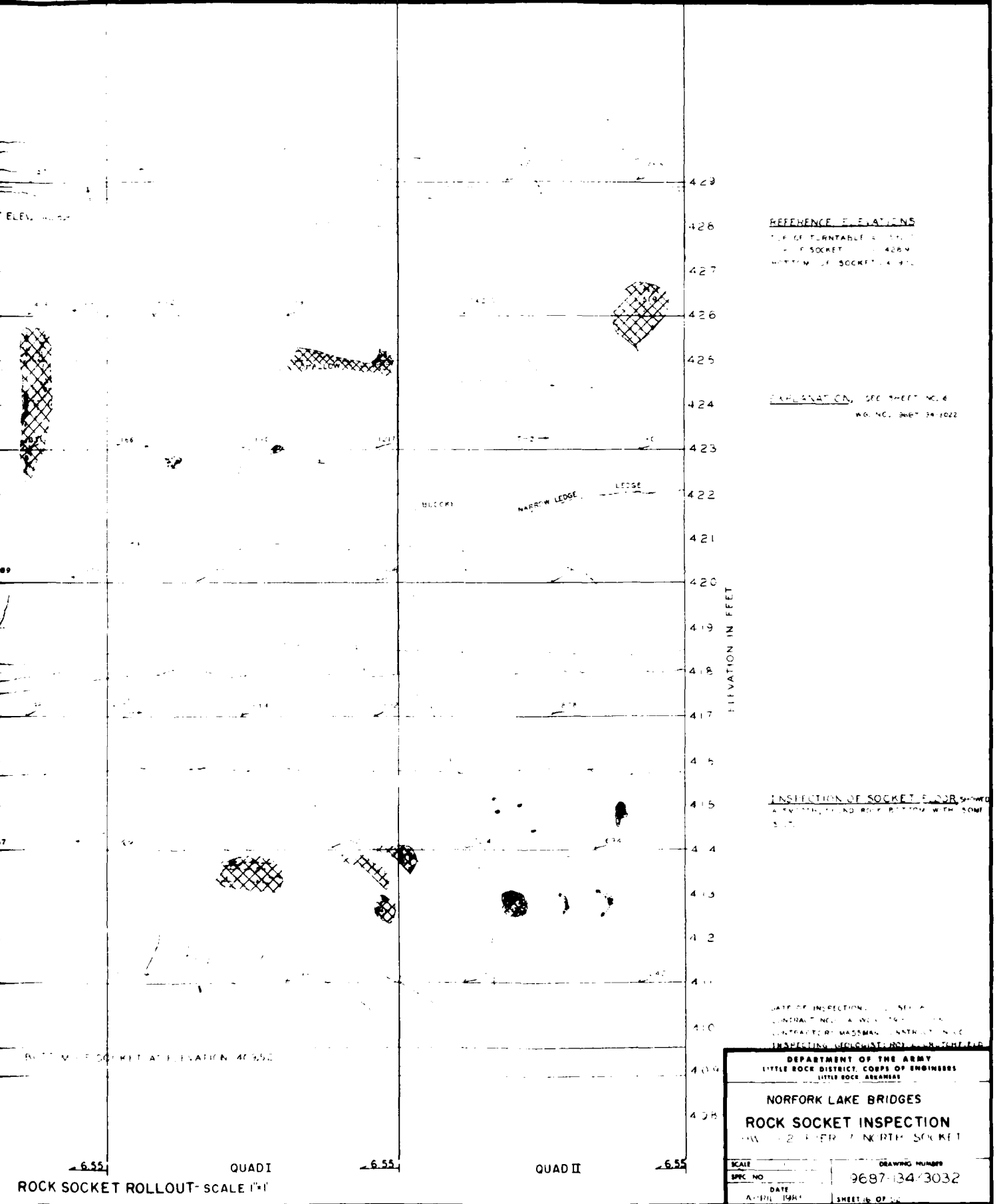
6.55

6.55

6.55



VALUE ENGINEERING WILL INCREASE YOUR PROFIT



DESIGN TOP OF SOCKET AT ELEV. 425.3

TIER NO. 7

TIER NO. 6

TIER NO. 5

TIER NO. 4

TIER NO. 3

TIER NO. 2

TIER NO. 1

ELEVATION IN FEET

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DESIGN BOTTOM OF SOCKET AT ELEV. 405.3

QUAD III

6.55

QUAD IV

6.55

QUAD V

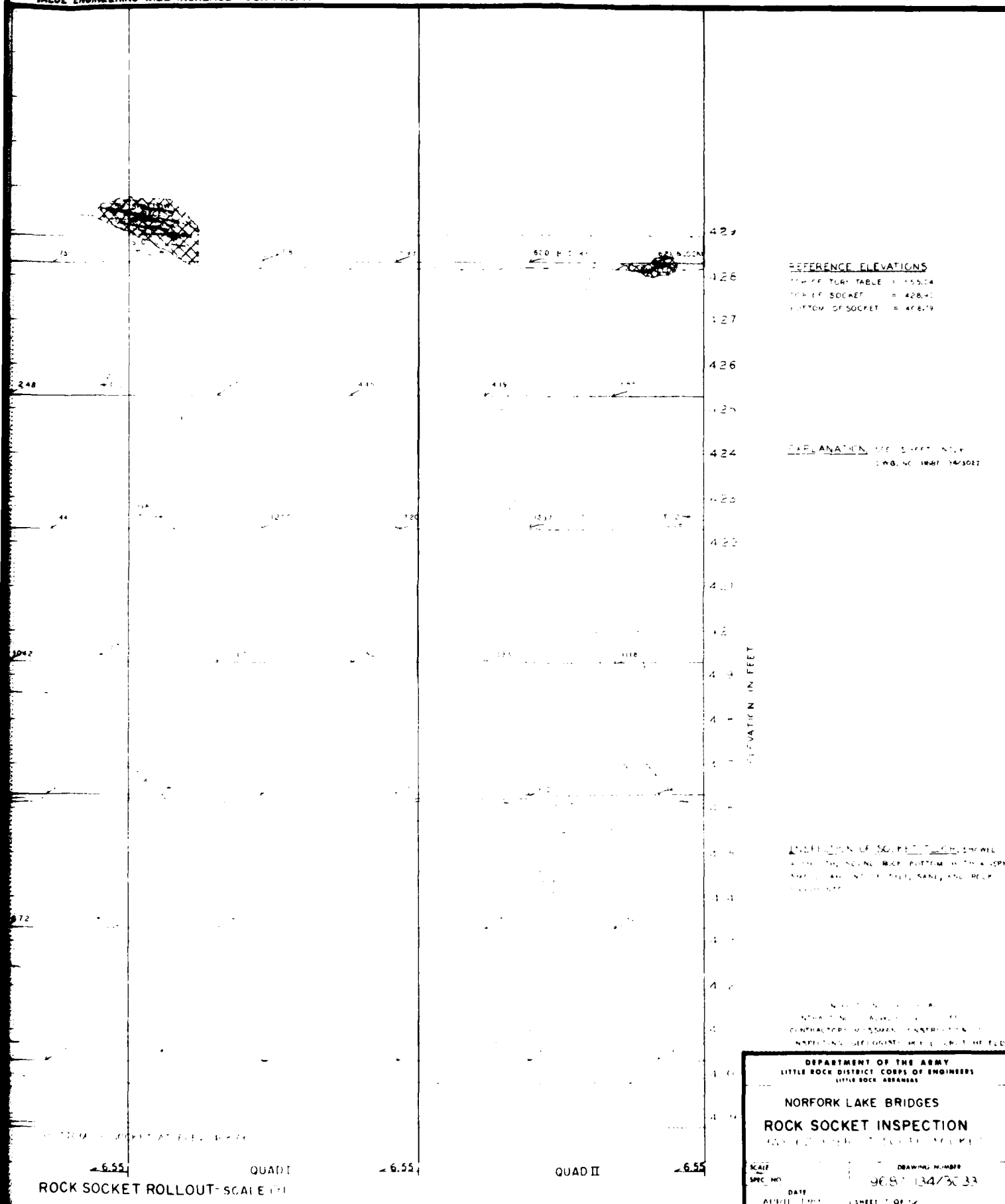
ROCK SOCKET ROLLOUT SCALE

WORK SAFETY

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|-------------|--|
| DATE | |
| BY | |
| CHECKED | |
| APPROVED | |
| PROJECT NO. | |
| SCALE | |
| REVISIONS | |

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| DATE | |
| BY | |
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| APPROVED | |
| PROJECT NO. | |
| SCALE | |
| REVISIONS | |

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF TURN TABLE = 425.04
 TOP OF SOCKET = 426.40
 BOTTOM OF SOCKET = 426.79

EXPLANATION

1. W.B. NO. 10001 10/10/02

1. POSITION OF SOCKET TO BE SHOWN
 2. POSITION OF NEARBY ROCK PATTERN WITH A COPY
 3. POSITION OF NEARBY TIE, NAIL, AND RAIL
 4. POSITION OF

1. POSITION OF SOCKET TO BE SHOWN
 2. POSITION OF NEARBY ROCK PATTERN WITH A COPY
 3. POSITION OF NEARBY TIE, NAIL, AND RAIL
 4. POSITION OF

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES ROCK SOCKET INSPECTION

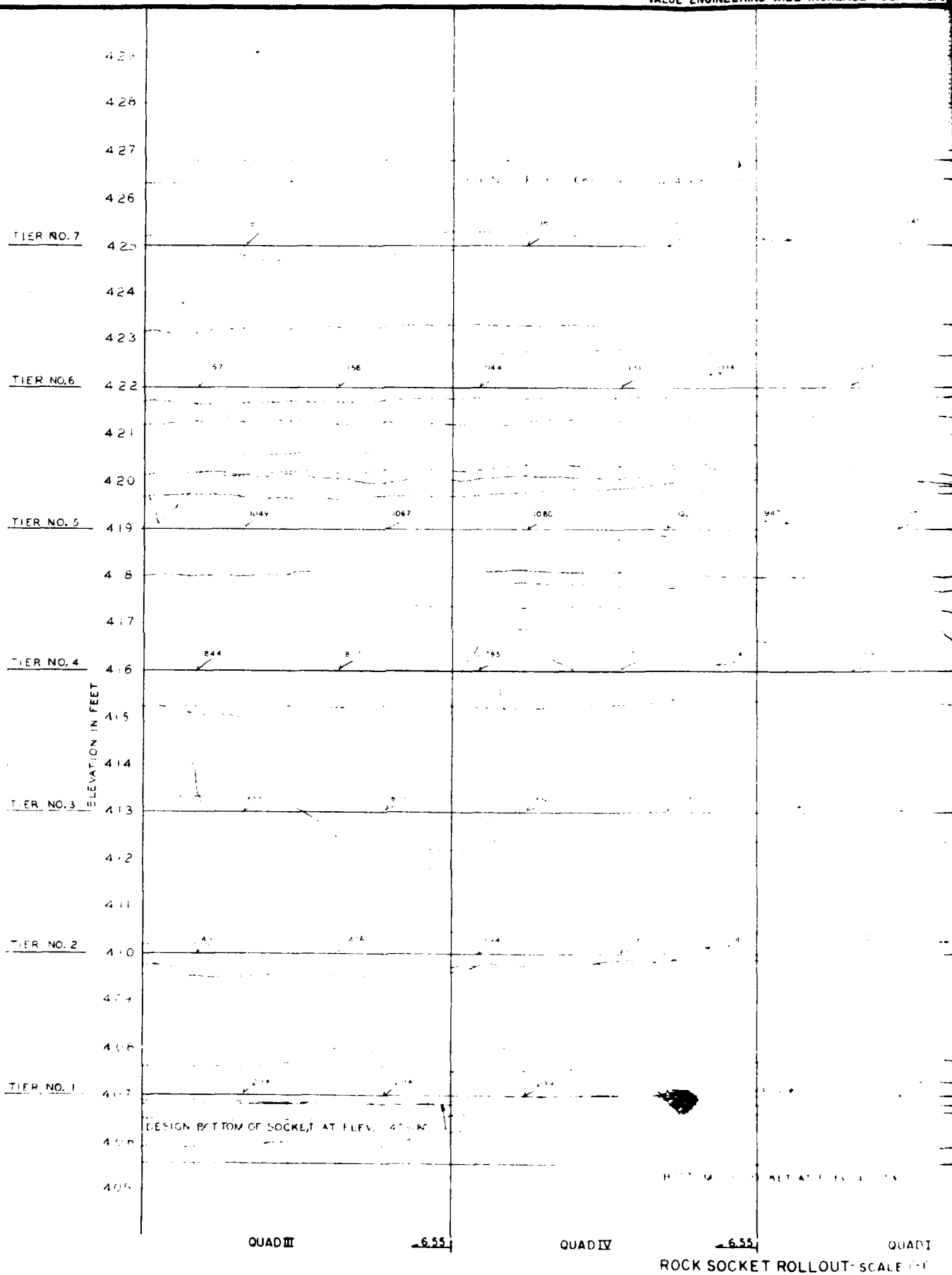
ANALYSIS OF ROCK SOCKET

SCALE
 SPEC. NO.
 DATE
 APPROVED
 DRAWING NUMBER
 9687 134/3033
 SHEET 1 OF 2

| | |
|----------|--|
| DATE | |
| BY | |
| CHECKED | |
| APPROVED | |
| REVISION | |
| NO. | |

| | |
|----------|--|
| DATE | |
| BY | |
| CHECKED | |
| APPROVED | |
| REVISION | |
| NO. | |

WORK SAFELY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT

ELEV. 4.74

REFERENCE ELEVATIONS

TOPOGRAPHIC SURFACE = 46.00
 ROCK SOCKET = 45.50
 BOTTOM OF SOCKET = 45.50

SCALE: AS SHOWN SHEET NO. 1
 (SHEET NO. 1 OF 1)

ELEVATION IN FEET

INSPECTION OF ROCK SOCKET SHOWED THAT THE SOCKET WAS CRACKED WITH NEW AND OLD REPAIRS WHICH FELL INTO THE SOCKET THROUGH THE CRACKS. THE CRACKS WERE NOT DETECTED DURING THE PROBLEM WAS CORRECTED AND INSPECTION SHOWED A GOOD JOINT. ROCK BOTTOM WITH OCCASIONAL SAND AND ROCK FRAGMENTS ALONG THE BASE OF THE SOCKET. (SEE MEMORANDUM WITH REFERENCE TO SHEET NO. 1)

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
 ROCK SOCKET INSPECTION
 MAY 1962 (P. 1) - NORTH BRIDGE

SCALE
 SPEC. NO.
 DATE

DRAWING NUMBER
 9037 1447 3034
 SHEET # OF 1

ROCK SOCKET ROLLOUT-SCALE 1"=1'

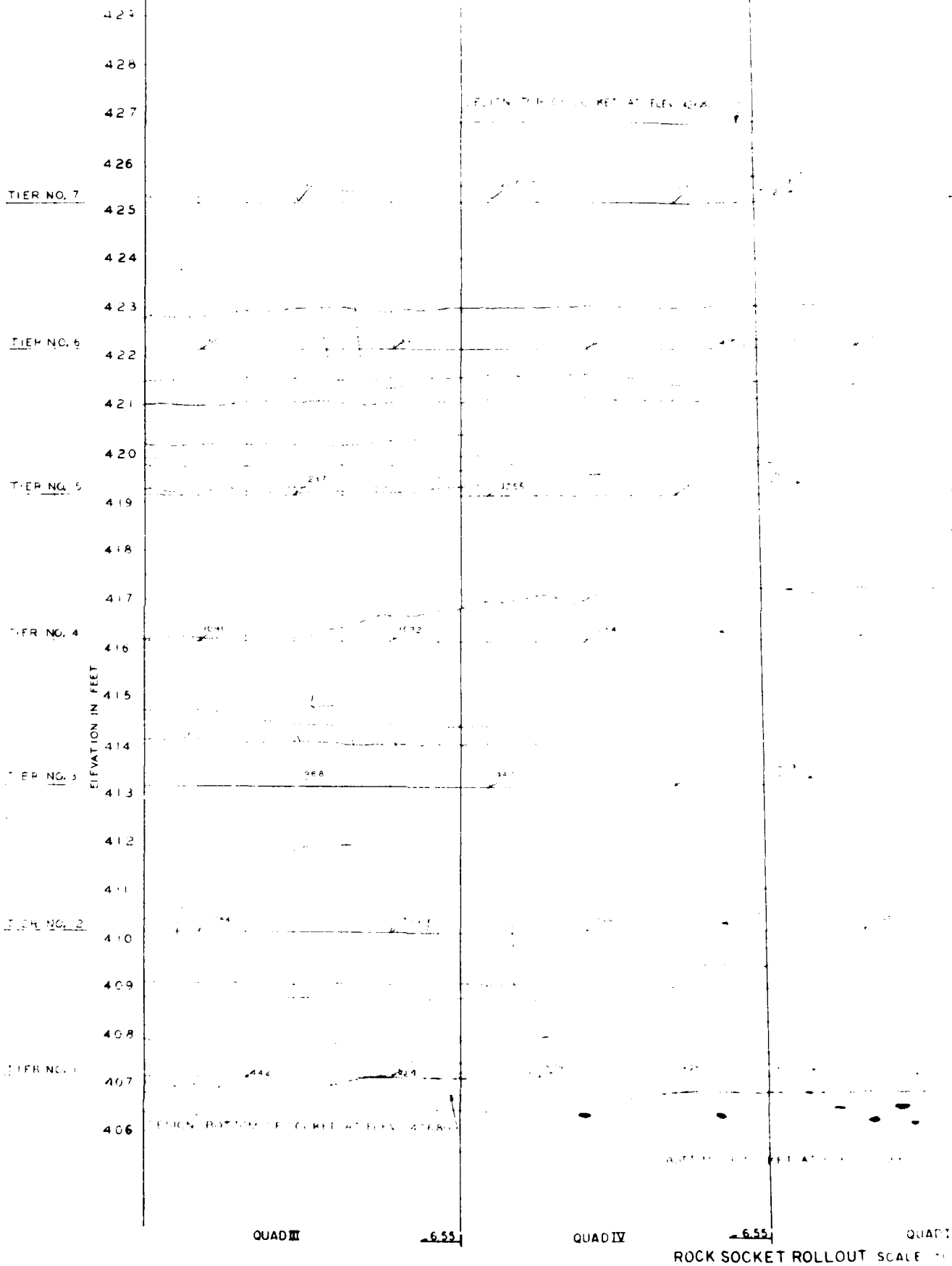
QUAD I

QUAD II

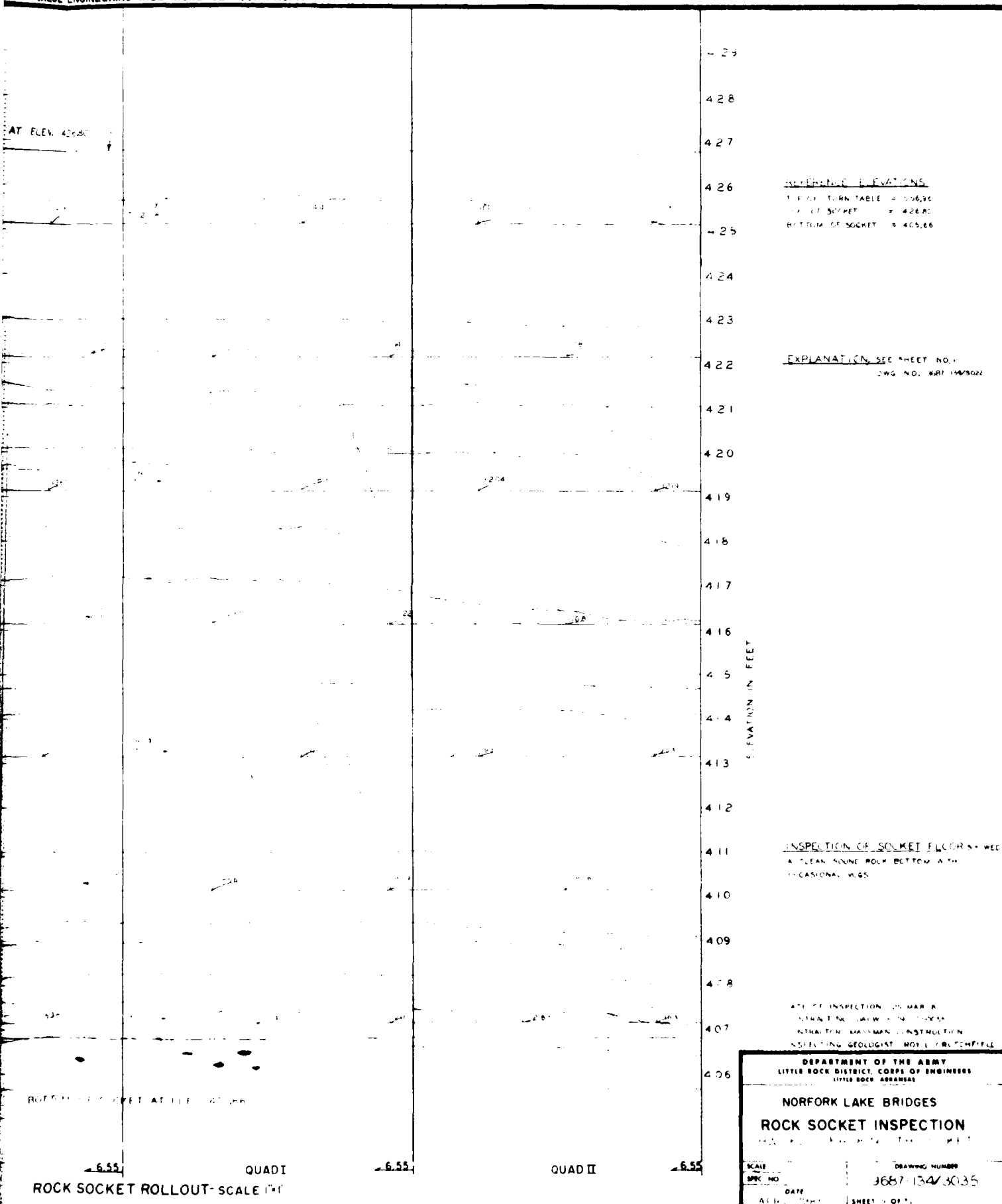
| WELL | DATE | DEPTH | TEMP. | WIND | WAVE | SEA | WIND | WAVE | SEA |
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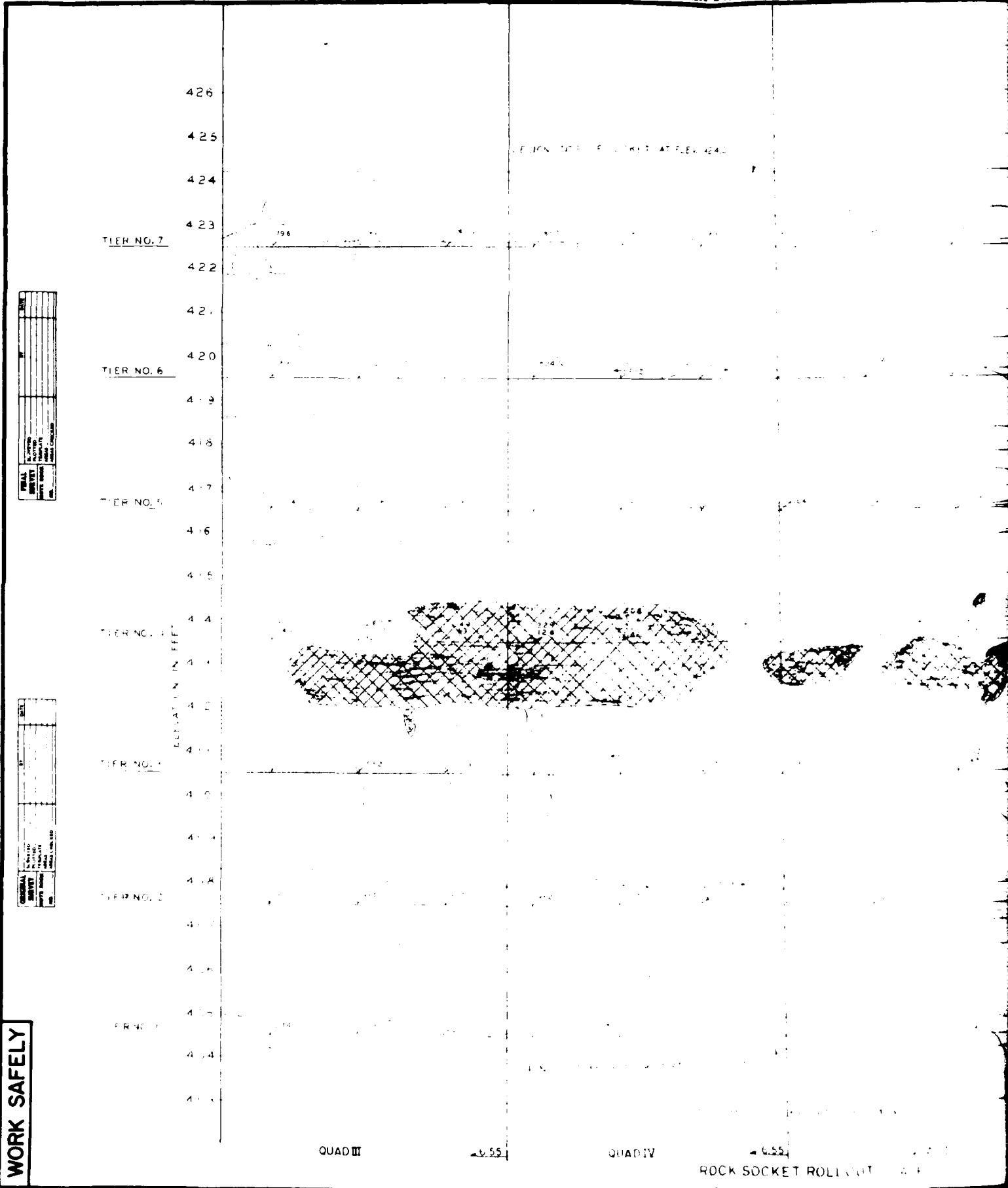
| WELL | DATE | DEPTH | TEMP. | WIND | WAVE | SEA | WIND | WAVE | SEA |
|------|------|-------|-------|------|------|-----|------|------|-----|
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WORK SAFELY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT





WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT

ELEV. 424.20

REFERENCE ELEVATIONS

TOPOGRAPHIC TABLE 157.95
 TOP OF SURVEY 424.20
 BOTTOM 424.50

SEE SHEET NO. 1
 (SEE SHEET NO. 1)

ELEVATION IN FEET

INSPECTION OF ROCK SOCKET ELEVATION
 WITH SCALE ROLL OUT BOTTOM OF SHEET
 AND SCALE ROLL OUT AND SCALE ROLL

INSPECTION OF ROCK SOCKET ELEVATION
 WITH SCALE ROLL OUT BOTTOM OF SHEET
 AND SCALE ROLL OUT AND SCALE ROLL

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
 ROCK SOCKET INSPECTION
 (WY 62 PIER 1 NORTH SOCKET)

DRAWING NUMBER
 SHEET NO. 1
 DATE
 11 NOV 1960
 SHEET 1 OF 1

ROCK SOCKET ROLL OUT SCALE

QUAD II

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|-------------------|-------|--|
| TIERAL SURVEY | DATE | |
| | BY | |
| GENERAL SURVEY | NOTED | |
| | NOTED | |
| NOTE BOOK | NO. | |
| | DATE | |

| | | |
|-------------------|------|--|
| GENERAL SURVEY | DATE | |
| | BY | |
| NOTE BOOK | NO. | |
| | DATE | |

WORK SAFELY

TIER NO. 1

TIER NO. 2

TIER NO. 3

TIER NO. 4

TIER NO. 5

TIER NO. 6

TIER NO. 7

ELEVATION
IN
FEET

4100
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4080
4070
4060
4050
4040
4030
4020
4010

QUAD III

6.55

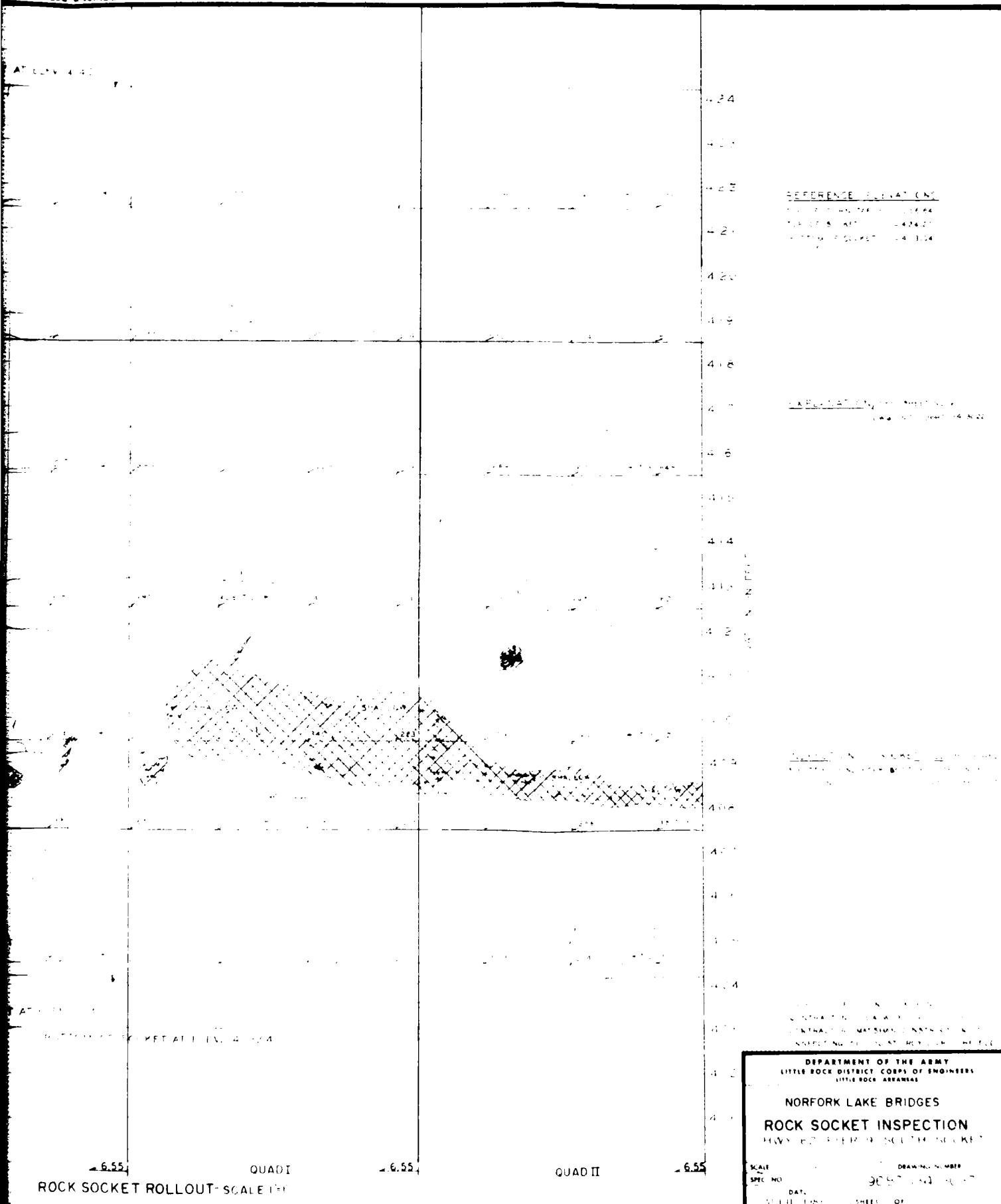
QUAD IV

6.55

ADI

ROCK SOCKET ROLLOUT SCALE

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF HIGHWAY 4.24
TOP OF BRIDGE 4.24
TOP OF SOCKET 4.24

EXPLANATION OF SYMBOLS

SEE DRAWING FOR DETAILS

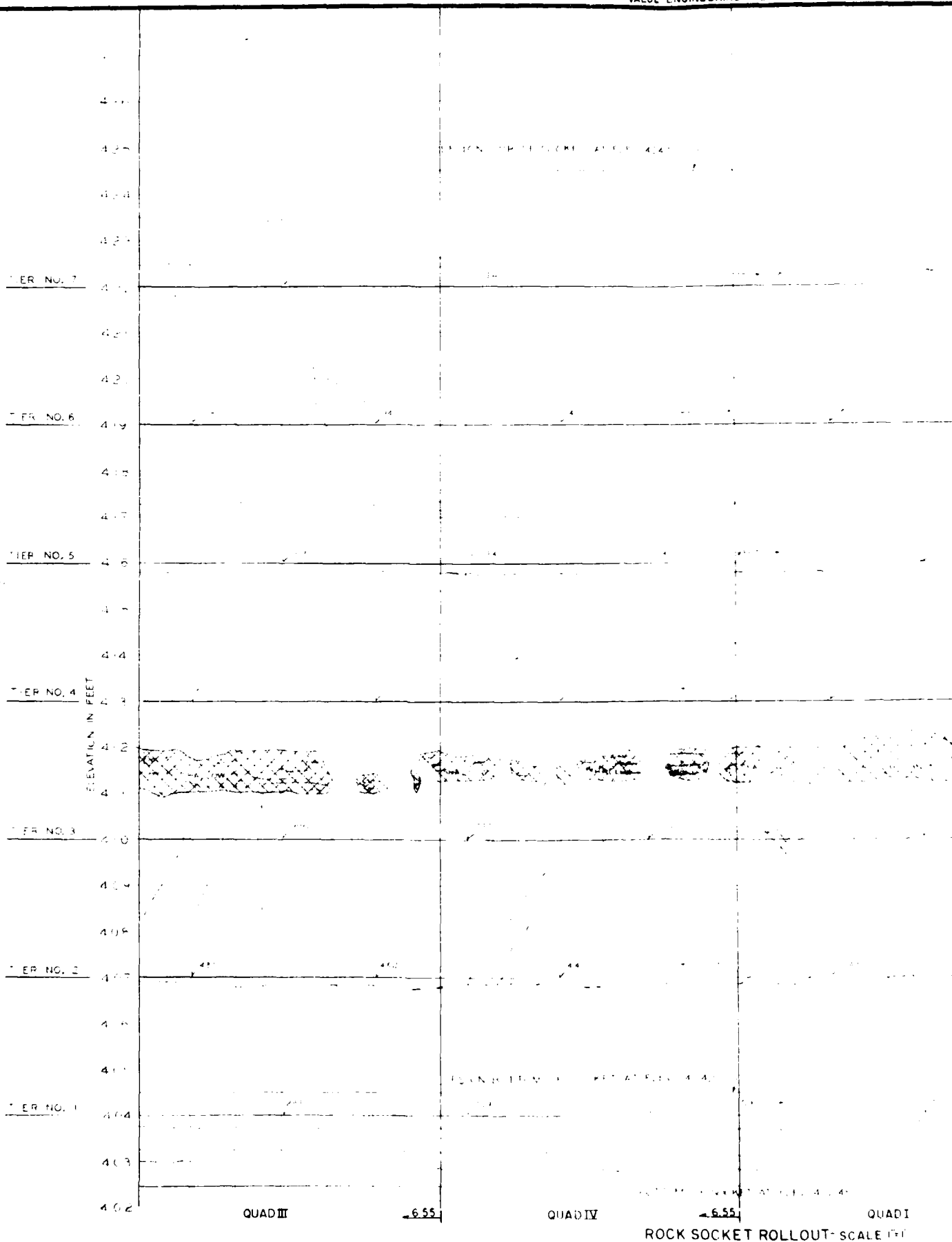
CONSTRUCTION OF BRIDGE
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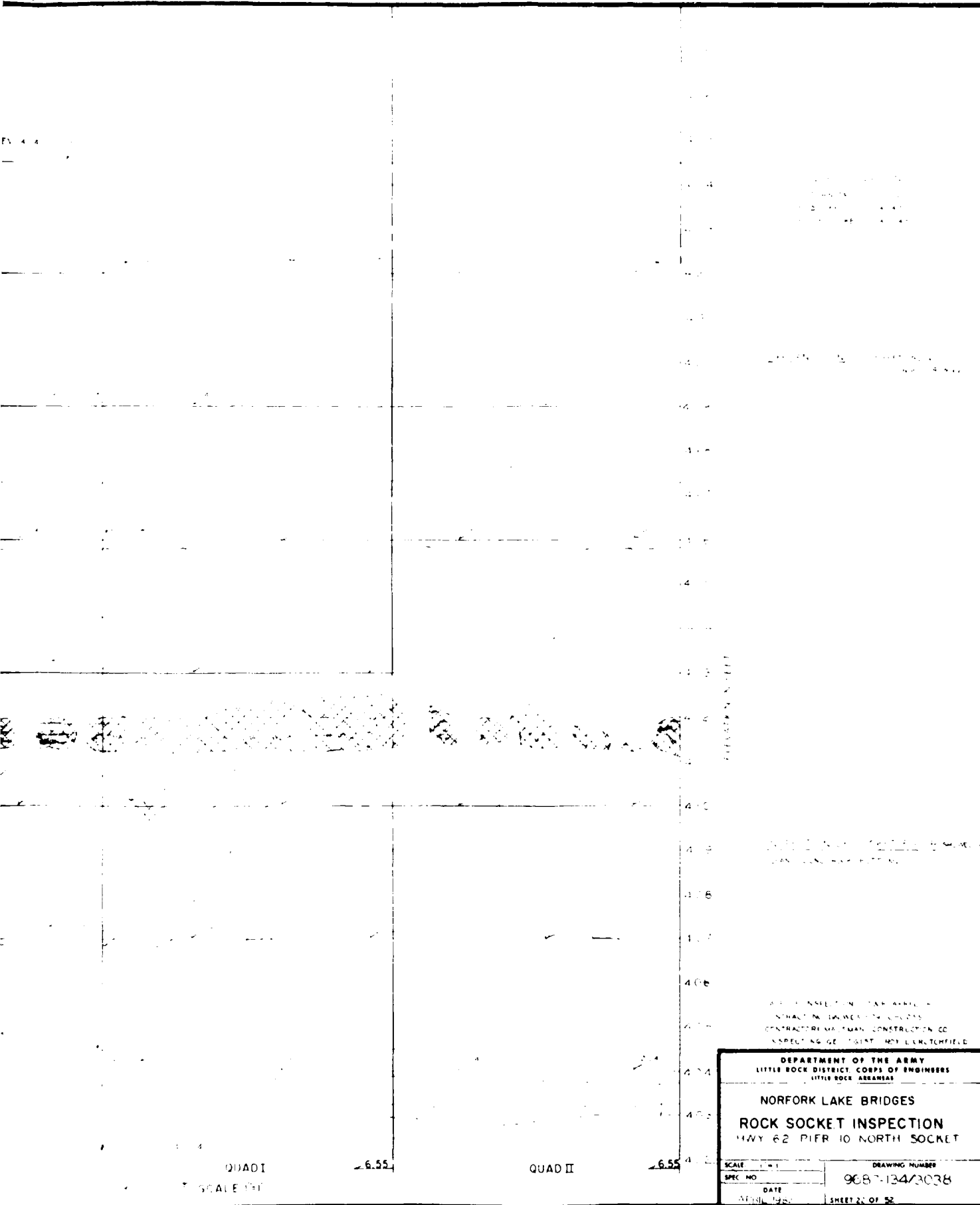
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 62 OVER R. SOUTH FORK

SCALE: 1/4" = 1'-0"
SPEC. NO. 905
DATE: 10/1/57
SHEET 1 OF 1



EX 4.4



| | |
|--|--|
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFOLK LAKE BRIDGES ROCK SOCKET INSPECTION HWY 62 PIER 10 NORTH SOCKET | |
| SCALE: 1" = 1' SPEC. NO. DATE ATTN: | DRAWING NUMBER 968-134/3038 SHEET 22 OF 32 |

FINAL
SURVEY
DATE: 10/2/77
BY: [Signature]
NO. 1

ORIGINAL
SURVEY
DATE: 10/2/77
BY: [Signature]
NO. 2

WORK SAFETY

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QUAD III

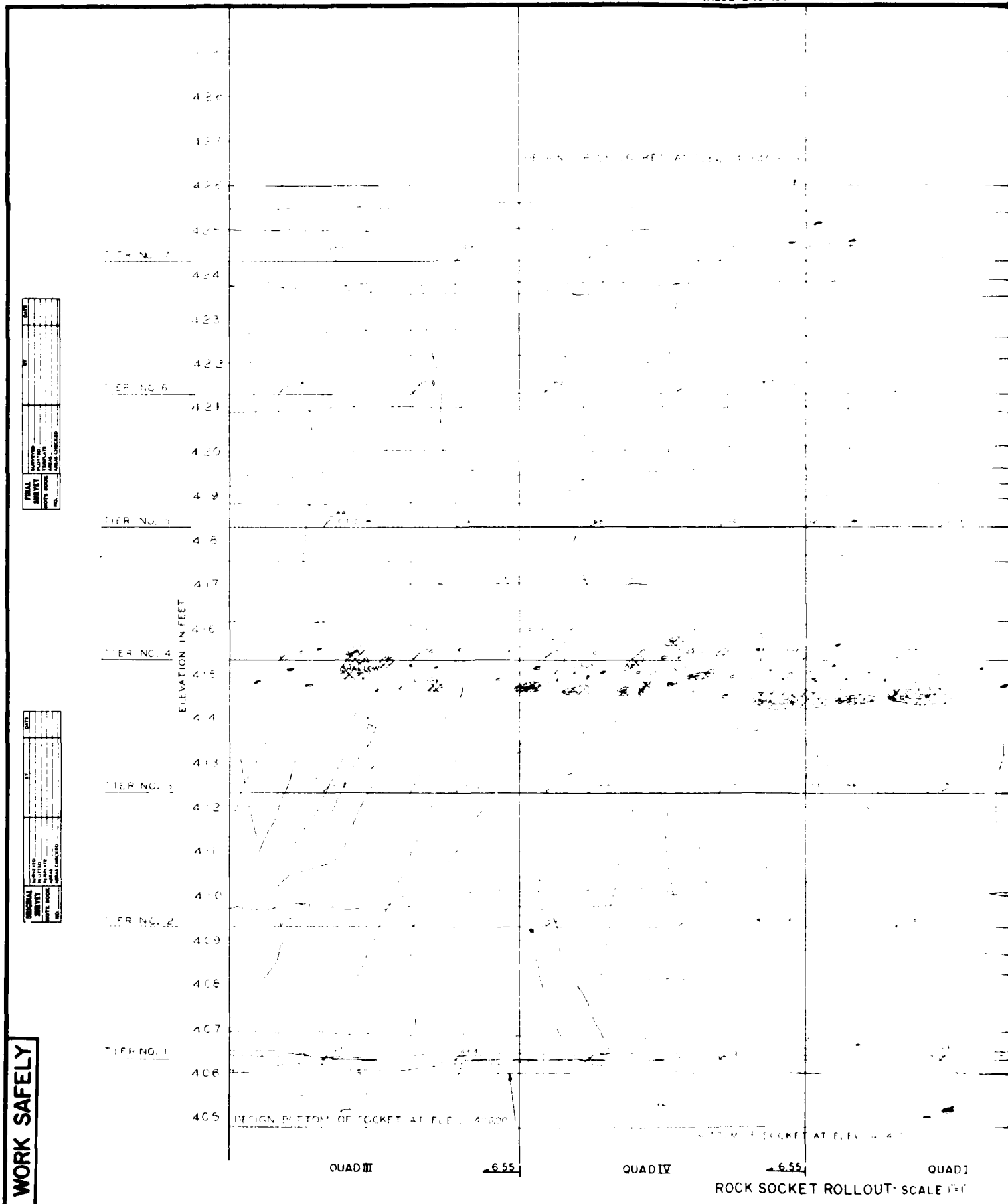
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QUAD IV

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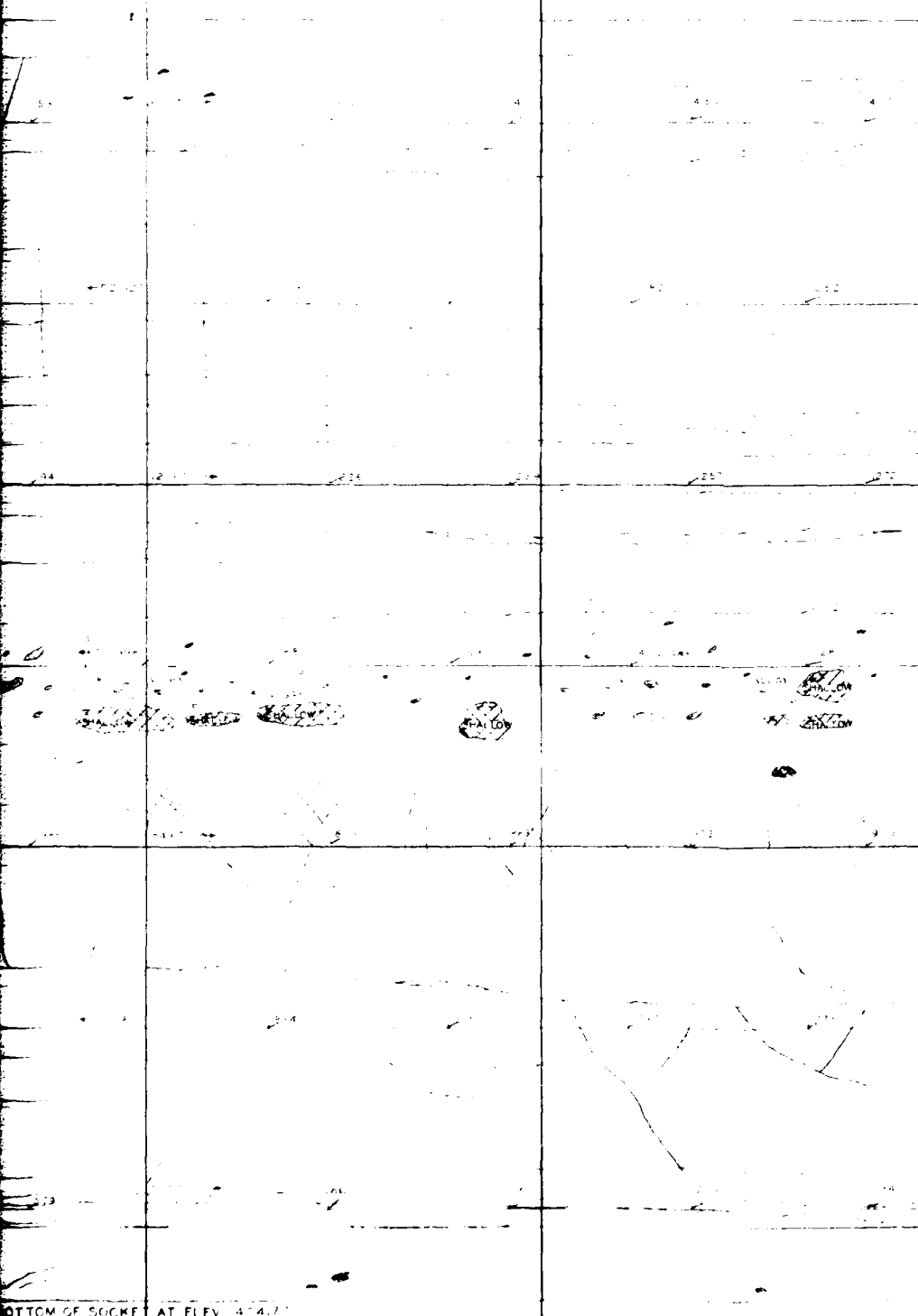
QUAD I

ROCK SOCKET ROLLOUT-SCALE (FEET)



VALUE ENGINEERING WILL INCREASE YOUR PROFIT

LEV. 4.00



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4.06
4.05

ELEVATION IN FEET

REFERENCE ELEVATION
TOP OF TURN TABLE 426.00
TOP OF SOCKET 426.00
BOTTOM OF SOCKET 404.77

EXPLANATION: THE SOCKET IS A
CIRCULAR SOCKET 34.80 FT.

INSPECTION OF SOCKET FOUND WITH A
LARGE CRACK RUNNING FROM THE TOP OF THE
SOCKET TO THE BOTTOM OF THE SOCKET. THE
CRACK IS APPROXIMATELY 1/4" WIDE AND
1/2" DEEP. A FEW SMALL CRACKS WERE ALSO
NOTED.

DATE OF INSPECTION: 10/15/55
CONTRACT NO. DAWD-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
ENGINEERING: GEORGE L. ROY, LITTLE ROCK, ARK.

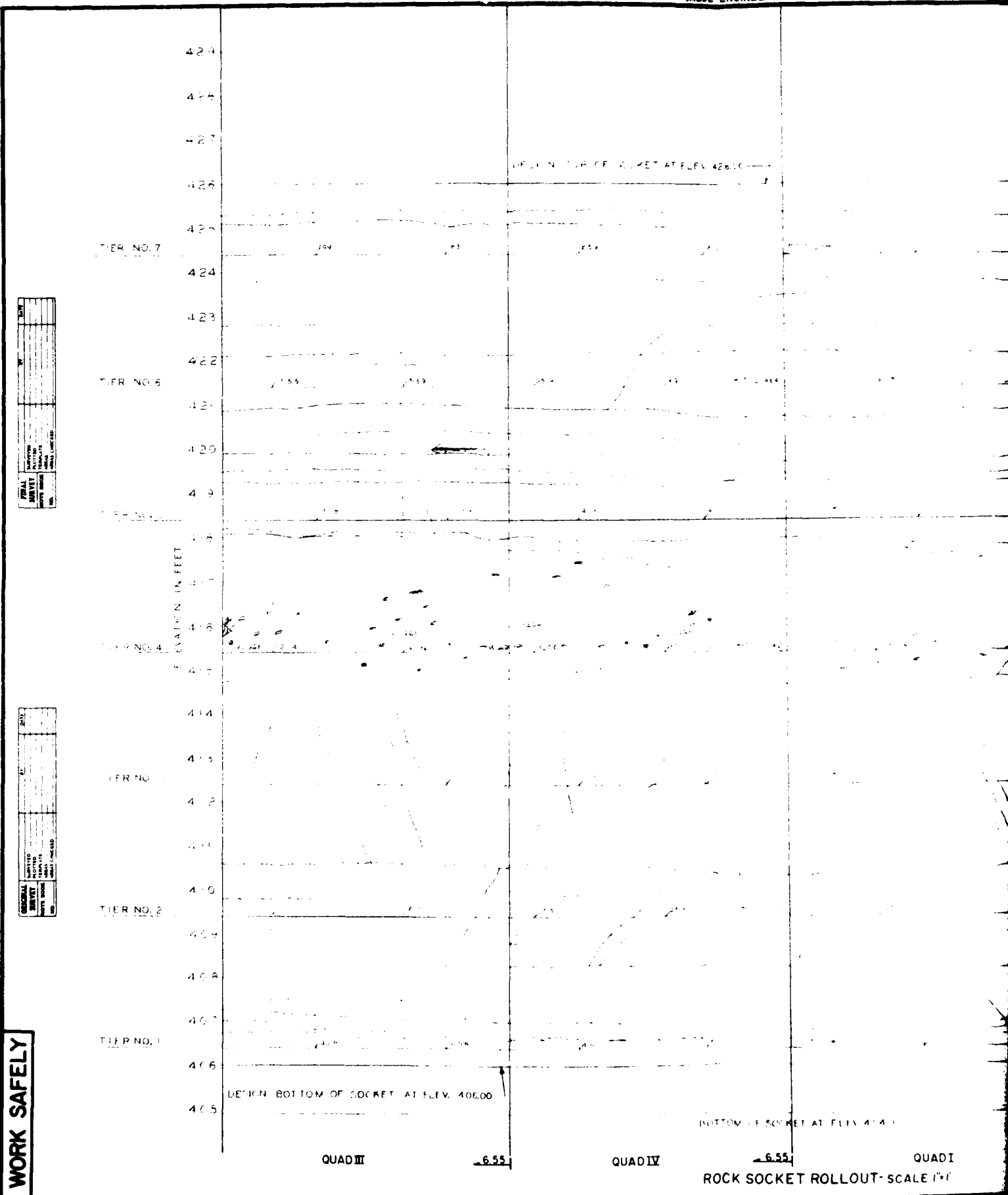
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 62 PIER II NORTH SOCKET

| | |
|-------------|----------------|
| SCALE | DRAWING NUMBER |
| SPEC NO. | 9687 134/3040 |
| DATE | SHEET 4 OF 5 |
| APR 11 1956 | |

ROCK SOCKET ROLLOUT- SCALE 1"=1"

QUAD II



AT ELEV. 426.00

ELEVATION IN FEET

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ROCK SOCKET ROLLOUT- SCALE 1"=1'

QUAD I

QUAD II

BOTTOM OF SOCKET AT ELEV. 424.9

6.55

6.55

6.55

6.55

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

DRAWING NUMBER 3657-1347-1041

SHEET NO. 1 OF 1

DATE

SPEC. NO.

SCALE

| | |
|-------------------|----------|
| TOP OF TURN TABLE | 449.94 |
| TOP OF SOCKET | 426.00 |
| BOTTOM OF SOCKET | - 404.90 |

EXPLANATION SEE SHEET NO. 1
 100' N. 0. 44.85' W. 30.22'

THE BORDER WALL WITH A TALL FENCE
OF ABOUT 4 IN. TO 6 IN. HEIGHT

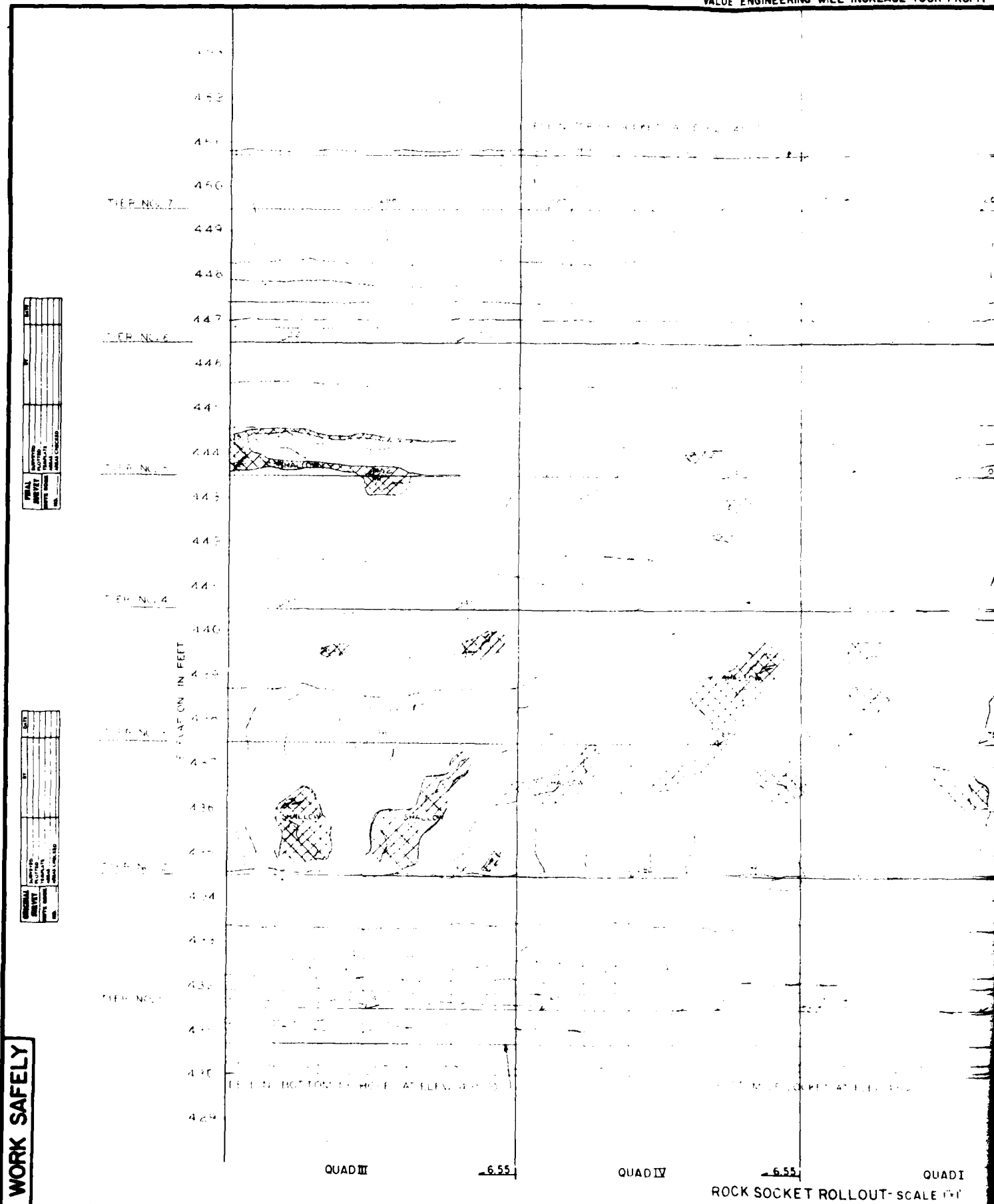
INTEGRAL, K. HASSMAN, CONSTRUCTION OF
FASSETT, N. G. (1981) 100-101, 101-102, 102-103

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

NORFOLK LAKE BRIDGES

ROCK SOCKET INSPECTION

| | |
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| SCALE | DRAWING NUMBER |
| SPEC NO | 3657-134/1041 |
| DATE | |
| 4-11-51 | SHEET 2 OF 2 |



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| DATE | |
| BY | |
| CHECKED | |
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WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT

AT ELEV. 4410

REFERENCE ELEVATIONS

Top of Rock Socket 4410
Top of Rock 4410
Top of Concrete 4410

EXPLANATIONS

1. SHEET NO. 2
2. 1/4" = 1' SCALE

ELEVATION IN FEET

INSPECTION OF ROCK SOCKET FOR DEFECTS
REVEALED A CRACK IN THE CONCRETE
ABOVE THE ROCK SOCKET. THE CRACK
INSPECTION REVEALED A CRACK IN THE
CONCRETE WITH A CRACK IN THE
ROCK SOCKET.

DATE OF INSPECTION: 12/24/54
CONTRACT NO. 12-10-10-10
CONTRACTOR: MAJESTIC CONSTRUCTION CO.
INSPECTING ENGINEER: ROY E. B. FIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

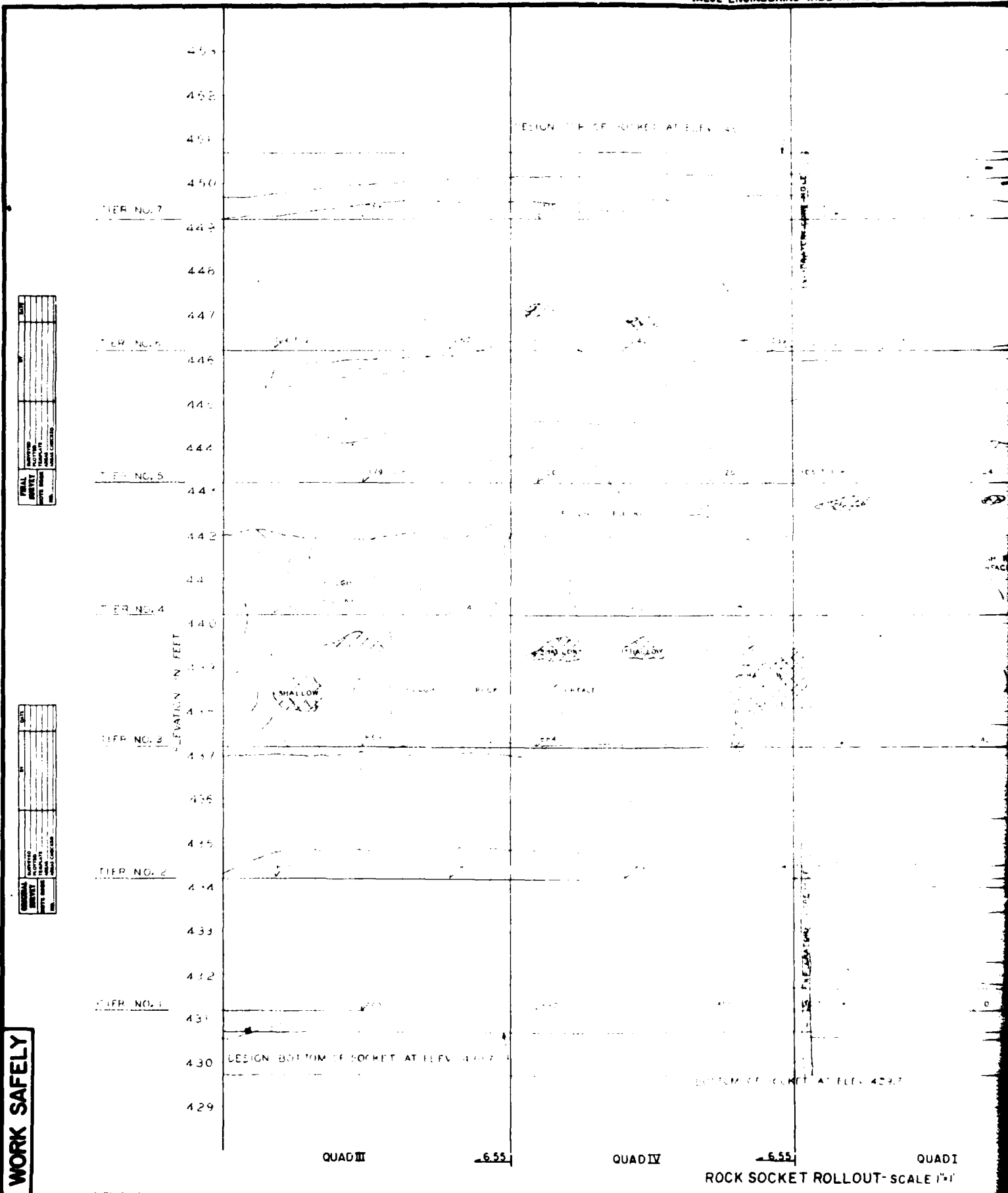
NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 62, BRIDGE 12, NORTH SOCKET

SCALE: 1/4" = 1'
SHEET NO. 2
DATE: APRIL 1955
DRAWING NUMBER: 9687-13473042
SHEET 25 OF 52

6.55 QUAD I
ROCK SOCKET ROLLOUT-SCALE 1/4"

QUAD II

6.55



WORK SAFELY

| DATE | |
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VALUE ENGINEERING WILL INCREASE YOUR PROFIT

ST ELEV. 429.71

20' HORIZONTAL SCALE

0.5' VERTICAL

BOTTOM OF GULCH AT ELEV. 429.71

6.55 QUAD I
ROCK SOCKET ROLLOUT-SCALE 1"=1'

QUAD II

430.1

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429.5

429.4

429.3

429.2

429.1

429.0

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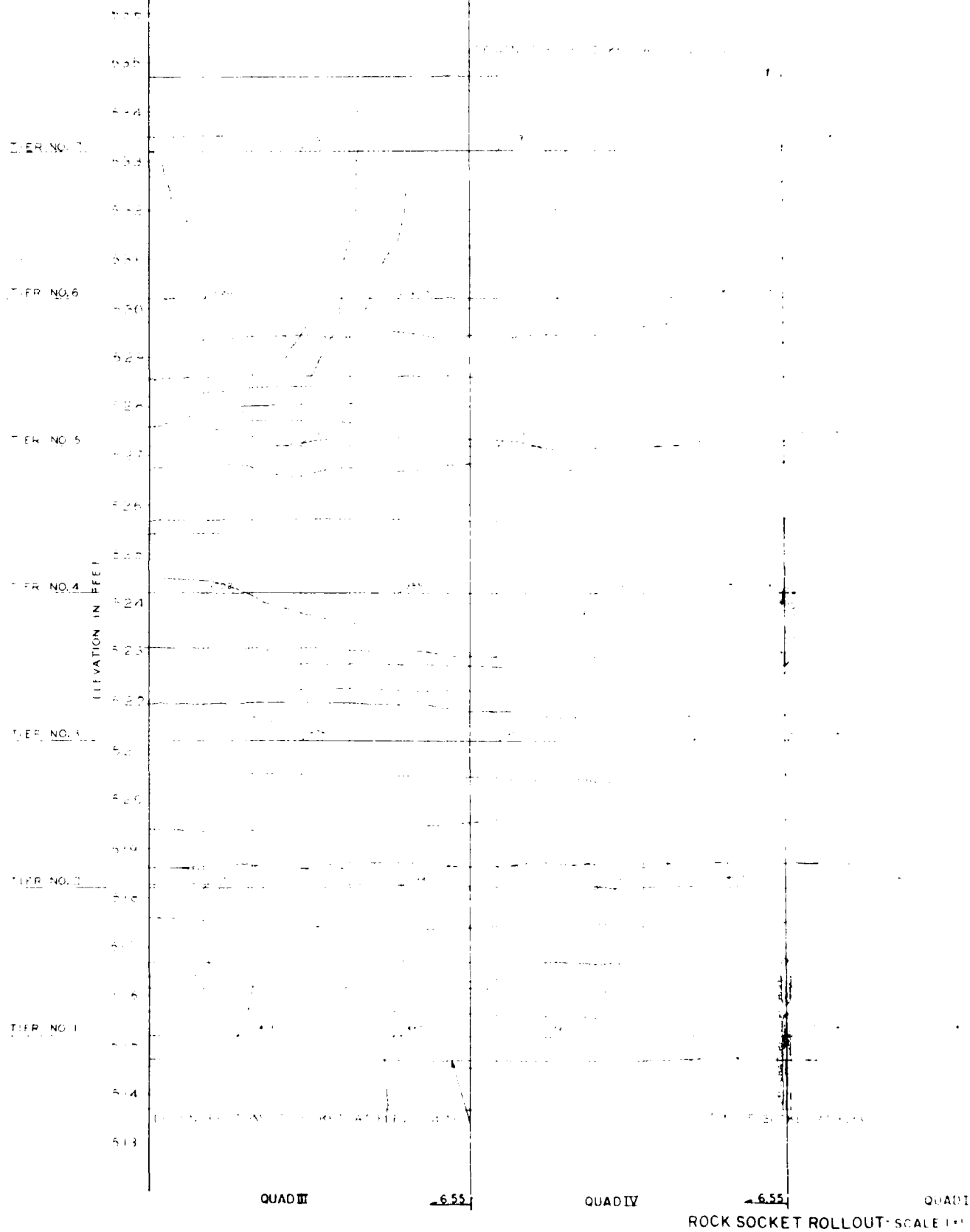
427.5

REFERENCE ELEVATION
TYPICAL ELEVATION
ELEV. 429.71
ELEV. 429.71

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| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFORK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| DRAWING NUMBER 9687-1347-3043 | |
| SCALE SHEET NO. DATE | DRAWING NUMBER 9687-1347-3043 |
| SHEET 1 OF 1 | |



WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT

AT ELEVATION

REFERENCE ELEVATIONS
 TOP OF ROCK SOCKET 100.00
 TOP OF CONCRETE 100.00
 BOTTOM OF ROCK SOCKET 100.00

EXPLANATION SEE SHEET NO. 6
 (SEE NO. 1067 1067 1067 1067 1067)

EXPLANATION SEE SHEET NO. 6
 (SEE NO. 1067 1067 1067 1067 1067)

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
 ROCK SOCKET INSPECTION

SCALE 1" = 10'
 DATE
 DRAWING NUMBER
 87-134/3044
 SHEET 28 OF 50

6.55 QUADI
 ROCK SOCKET ROLLOUT-SCALE 1"=1'

6.55 QUADI

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WORK SAFELY

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| DATE | |

QUAD III

QUAD III

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QUAD IV

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ROCK SOCKET ROLL CUT

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NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS
WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT
LITTLE ROCK ARK R L CRUTCHFIELD JUN 83

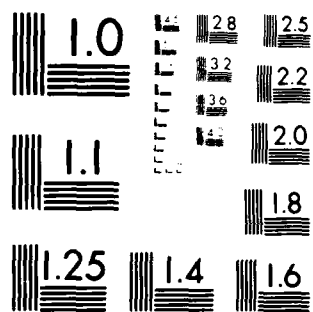
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THE ENGINEERING WILL INCREASE YOUR PROFIT

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REFERENCE ELEVATIONS

536.00 - TOP OF ROCK SOCKET
534.00 - TOP OF ROCK SOCKET
532.00 - TOP OF ROCK SOCKET

EXHIBIT A - SEE SHEET NO. 6
L.A. 2100, DEPT. 34-3022

INSPECTION OF SOCKET FLOOR, SHOWING
A CRACK IN THE FLOOR, AND THE
CRACK IN THE FLOOR, AND THE
CRACK IN THE FLOOR, AND THE
CRACK IN THE FLOOR, AND THE

DATE OF INSPECTION - 11 MAR 68
LITTON, CALIF. 94030, CIV. 001
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING: GEOLOGIST: ROY L. CRITCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 62 PIER 13 SOUTH SOCKET

SCALE: 1" = 10'
SPEC. NO.
DATE
APRIL 1968

DRAWING NUMBER
9687-134/3045
SHEET 2007 56

ELEVATION IN FEET

BOTTOM 100 FEET AT ELEVATION

6.55 QUADI
ROCK SOCKET ROLLOUT-SCALE 1"=1'

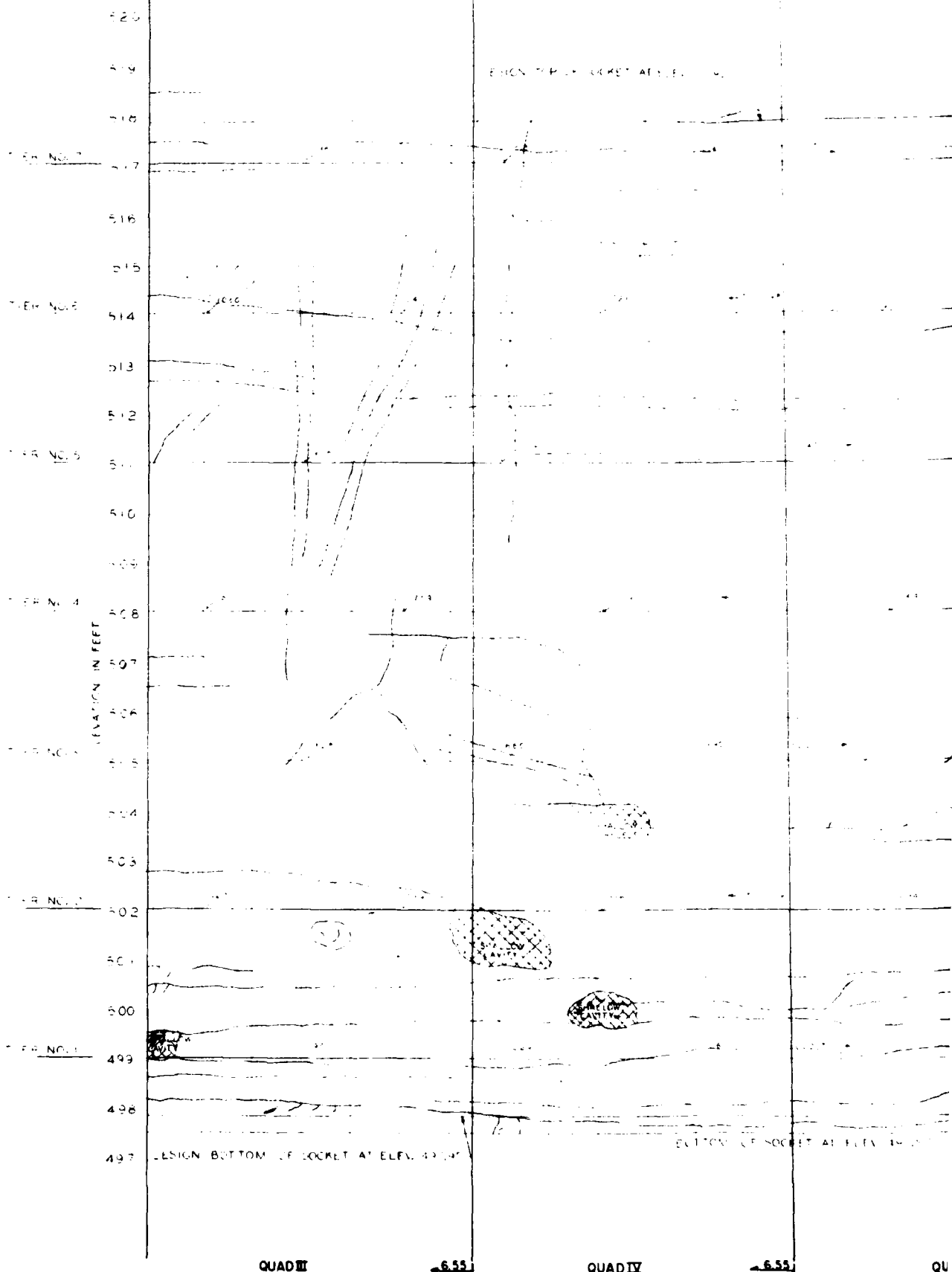
6.55 QUAD II

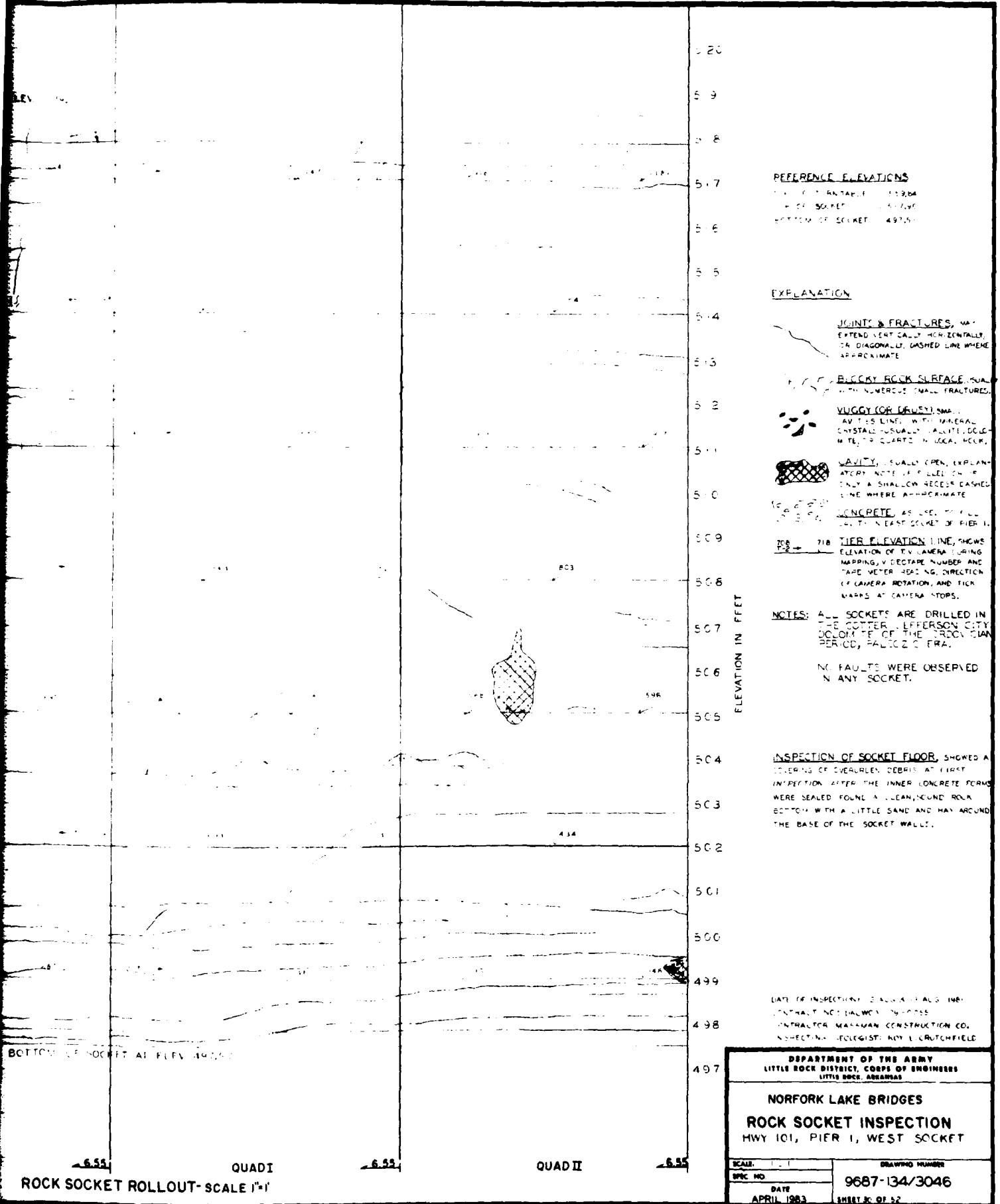
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WORK SAFELY

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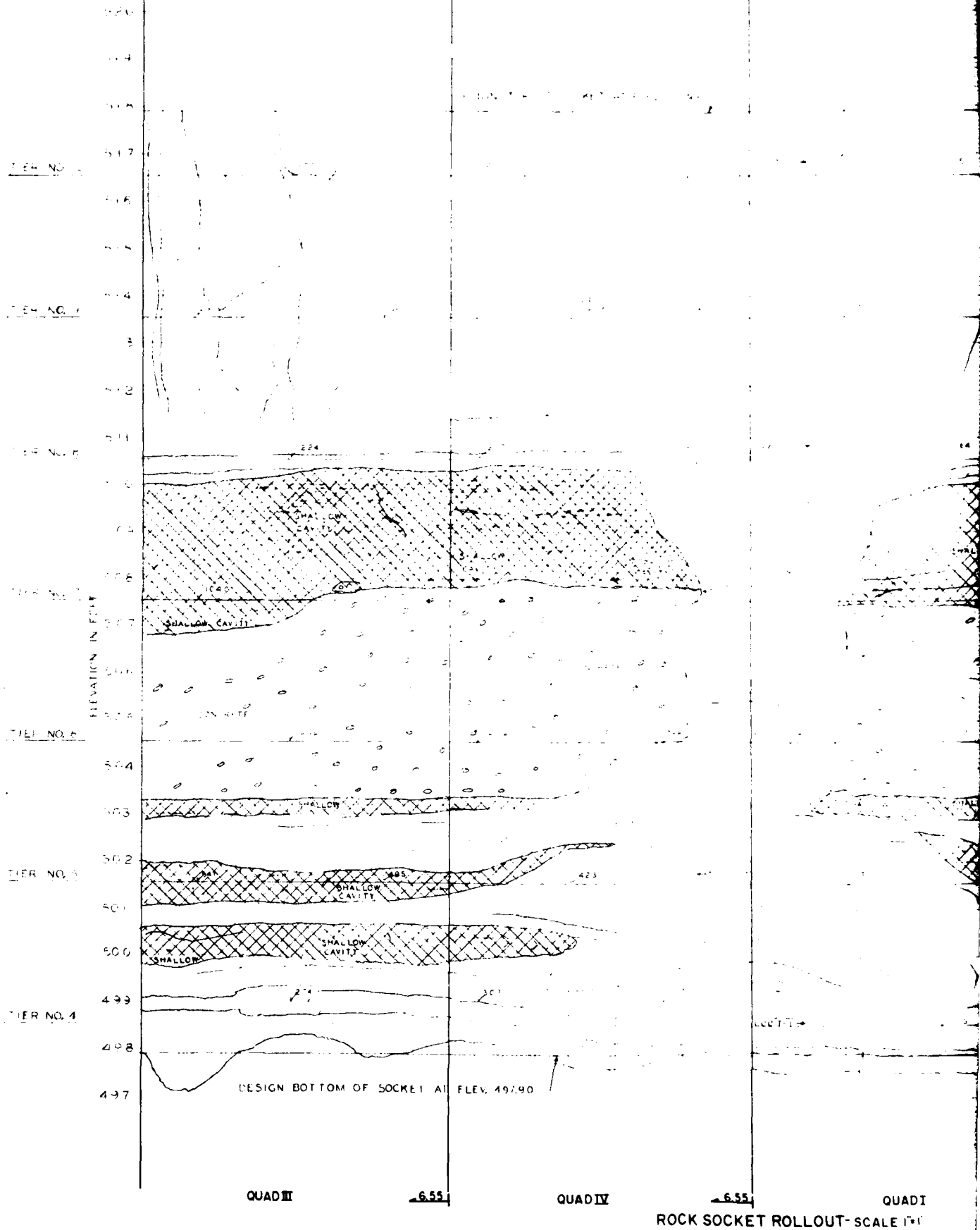
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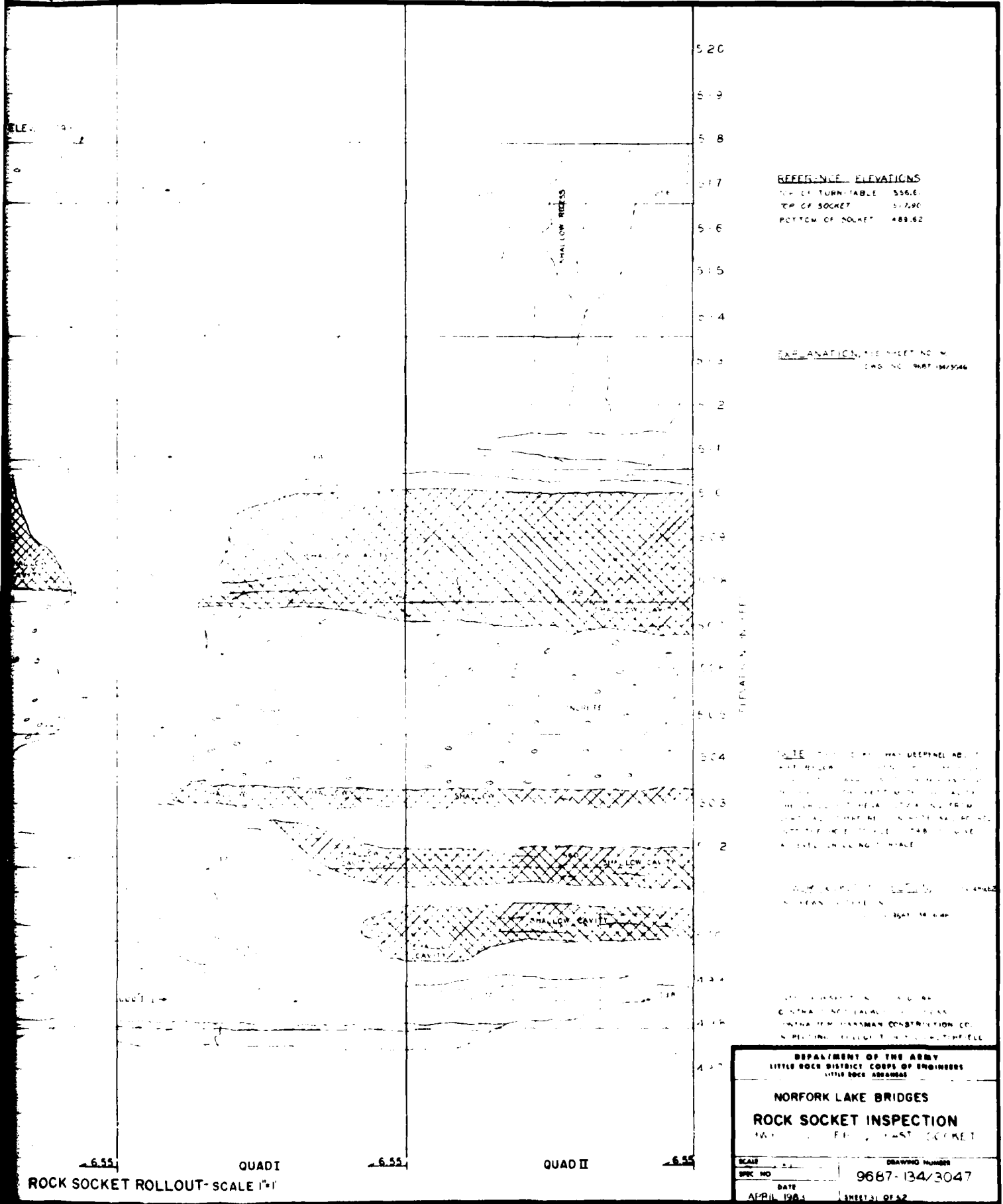




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WORK SAFELY

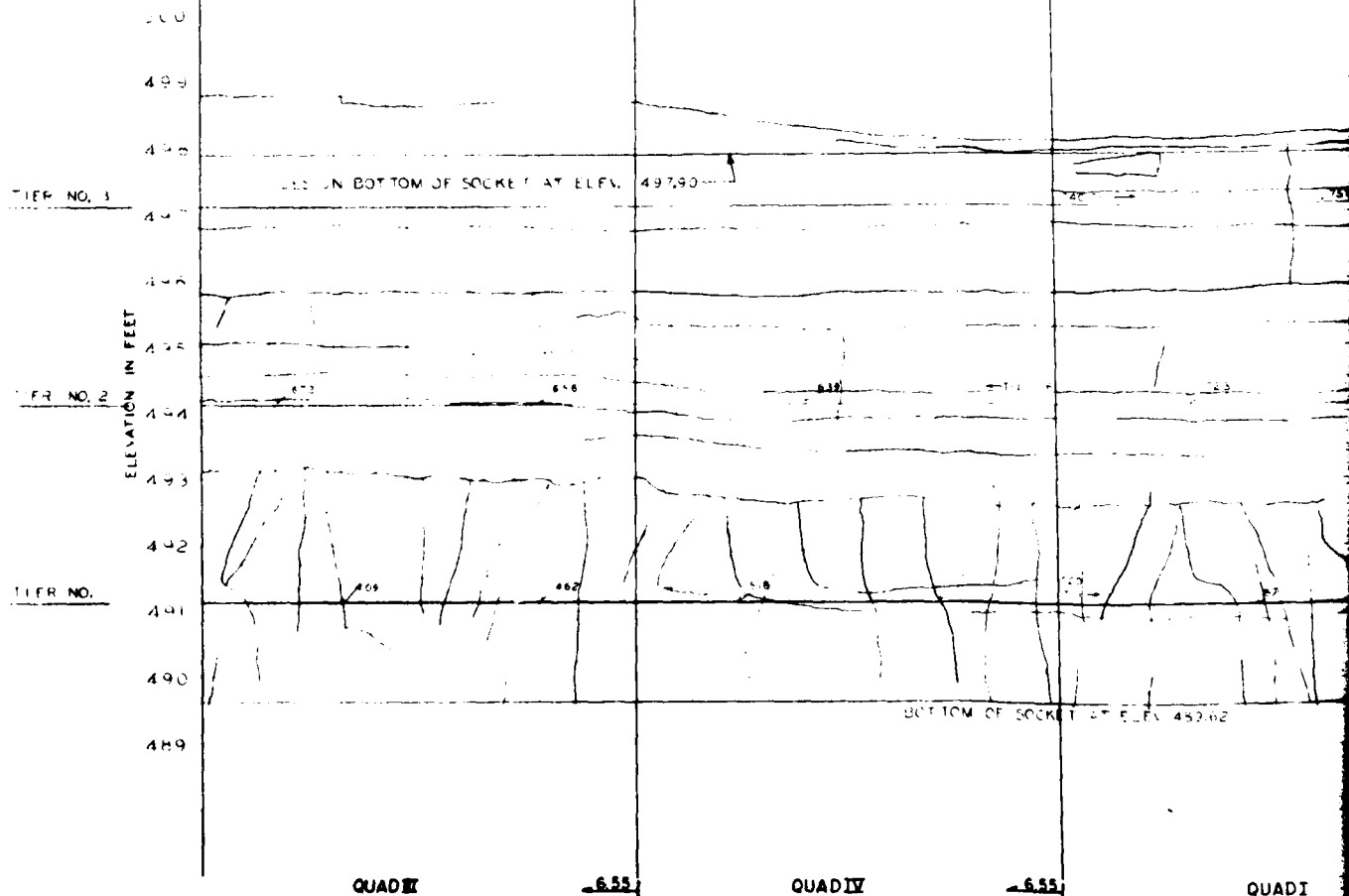




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WORK SAFELY



ROCK SOCKET ROLLOUT- SCALE 1"=1'

VALUE ENGINEERING WILL INCREASE YOUR PROFIT

REFERENCE ELEVATIONS

TOP OF TURN-TABLE 498.11
TOP OF SOCKET 517.90
BOTTOM OF SOCKET 489.62

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ELEVATION IN FEET

EXPLANATION, SEE SHEET NO. 30
DWG. NO. 9687-34/3048

UPPER SOCKET INSPECTION, TO ELEV.
517.90 AS SHOWN ON SHEET NO. 31
DWG. NO. 9687-34/3048

INSPECTION OF SOCKET FLOOR SHOWED
A CLEAN, SOUND ROCK BOTTOM.

DATE OF INSPECTION: 10 AUG 1988
CONTRACT NO. DALWET-79-0055
CONTRACTOR: MASSEMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 1, EAST SOCKET

SCALE: 1" = 1'
SPEC. NO.
DATE
APRIL 1983

DRAWING NUMBER
9687-134/3048
SHEET 32 OF 32

BOTTOM OF SOCKET AT ELEV 489.62

6.55 QUAD I
ROCK SOCKET ROLLOUT- SCALE 1"=1'

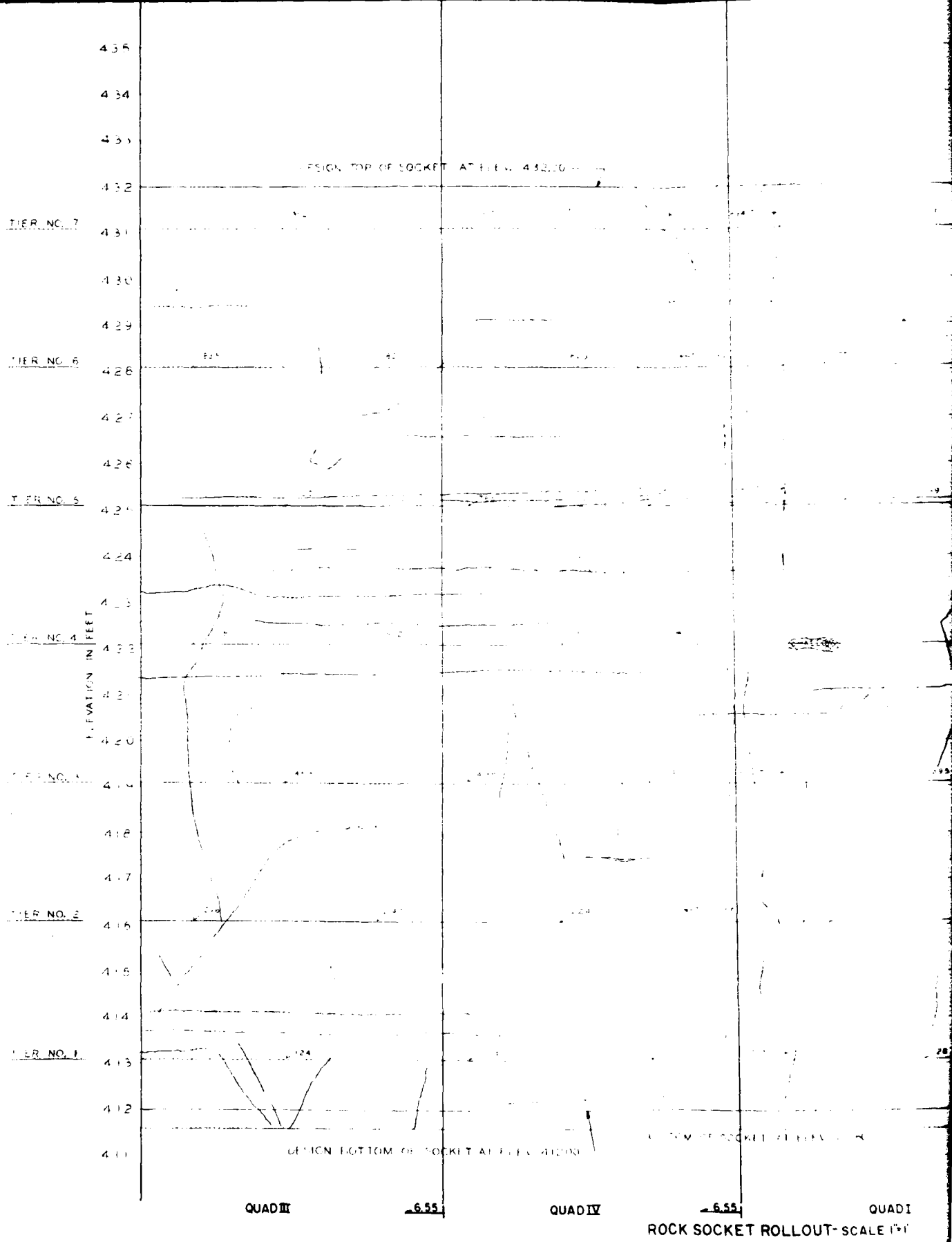
6.55 QUAD II

6.55

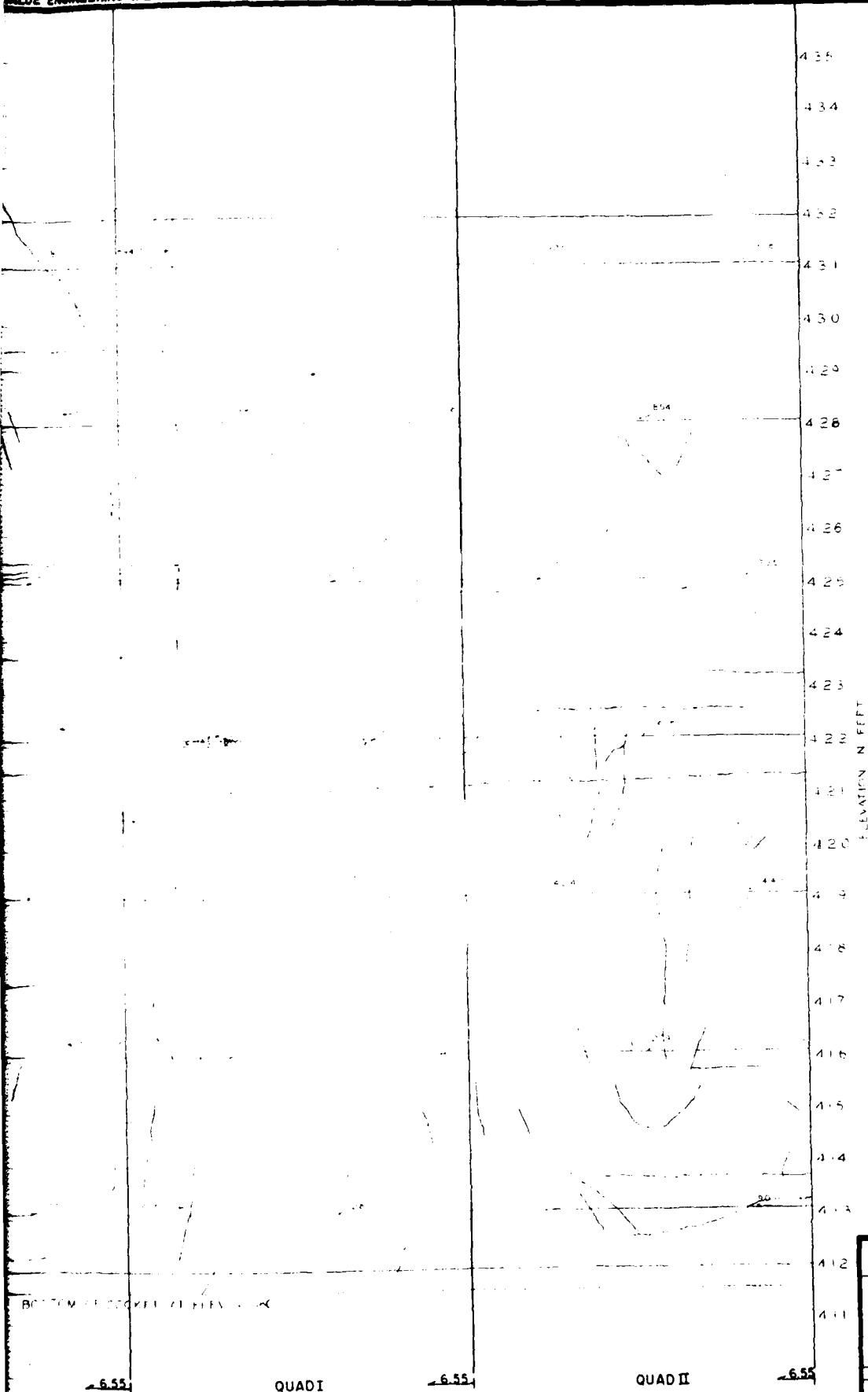
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WORK SAFELY



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REFERENCE ELEVATIONS

TOP OF TURN TABLE 558.00
TOP OF SOCKET 432.00
BOTTOM OF SOCKET 411.60

EXPLANATION

SEE SHEET NO. 90
AND NO. 9687-34/3046

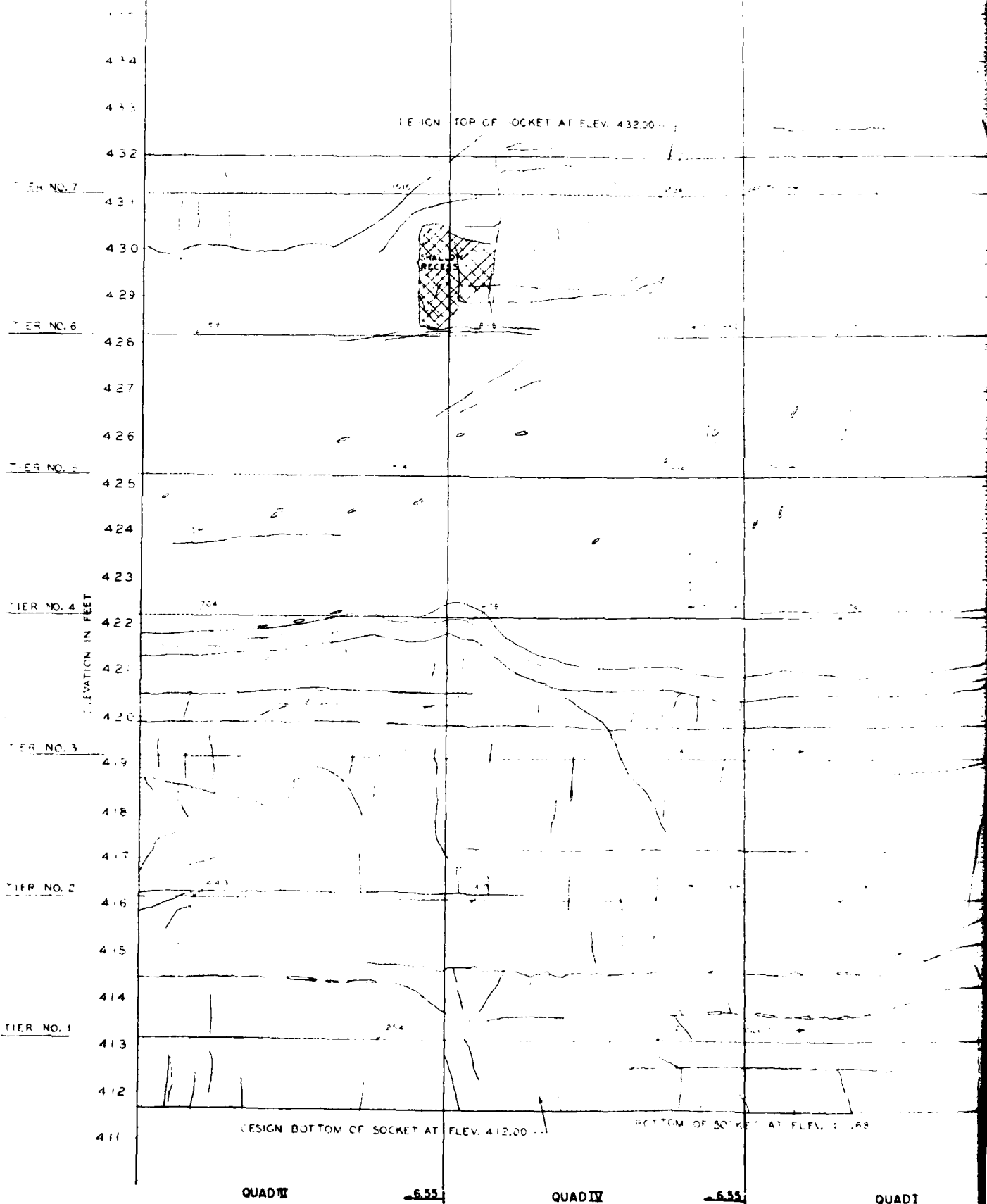
DEPTH OF SOCKET FLOOR - HOWEL A
VERIFICATION OF CONCRETE LEVEL AT THE
INSPECTION AFTER THE CONCRETE
FLOOR WERE PLACED OVER A LEAN
CONCRETE BOTTOM

DATE OF INSPECTION: 11 SEP 98
CENTRAL DISTRICT, CORPS OF ENGINEERS
CONTRACTOR: MATTHEW CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRITCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 3, EAST SOCKET

SCALE: 1"=1'
SHEET NO. 90
DATE: APRIL 1983
DRAWING NUMBER: 9687-134/3049
SHEET 33 OF 50



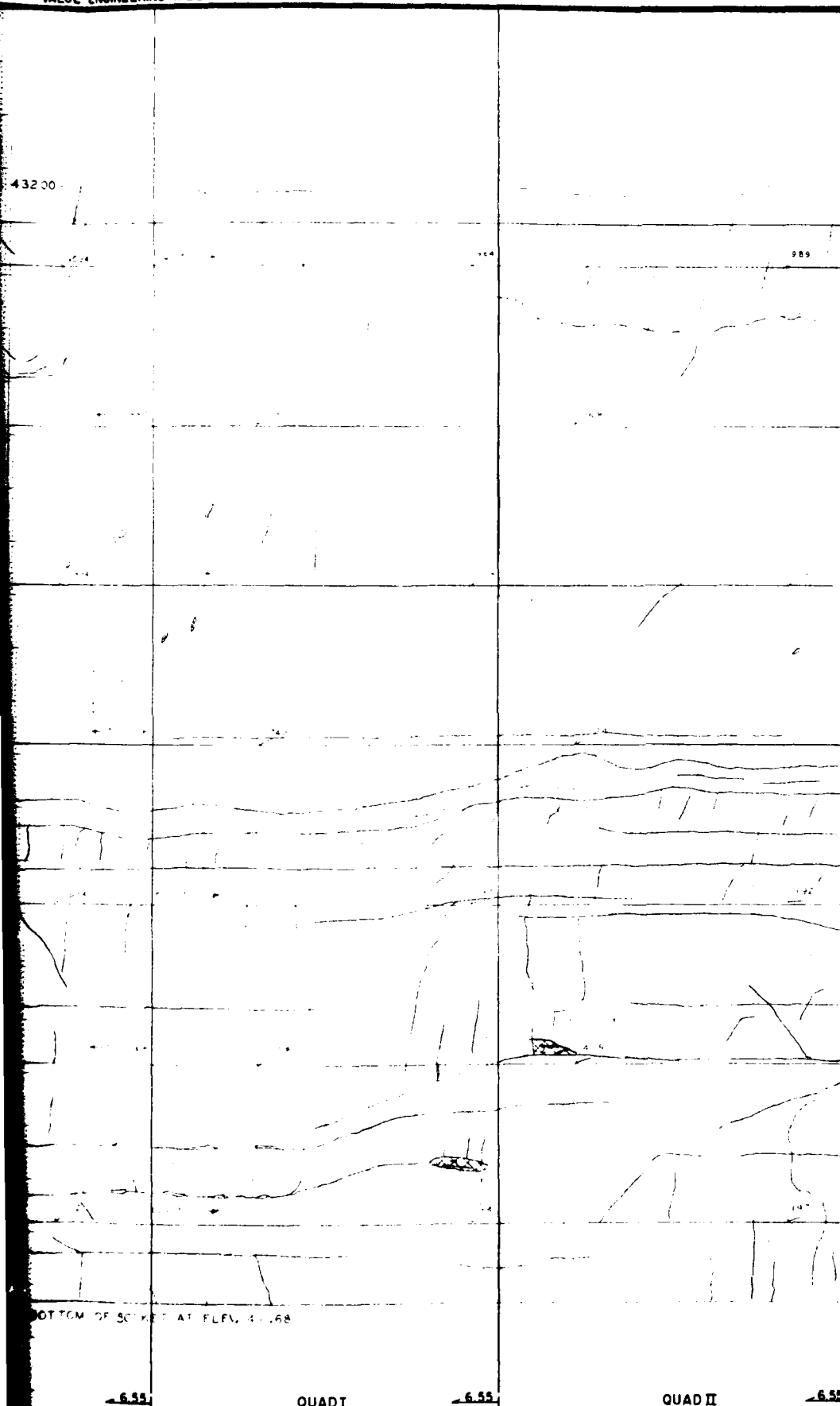
ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

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VALUE ENGINEERING WILL INCREASE YOUR PROFIT



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ELEVATION IN FEET

REFERENCE ELEVATIONS

TOP OF TURN TABLE = 560.11
TOP OF SOCKET = 432.00
BOTTOM OF SOCKET = 411.68

EXPLANATION SEE SHEET NO. 30

DWG. NO. 9687-134/3048

INSPECTION OF SOCKET FLOOR SHOWED A
CLEAN, SOUND ROCK BOTTOM.

DATE OF INSPECTION: 16 SEP 1981
CONTRACT NO. DAWCS-79-C-0055
CONTRACTOR: MASHAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTENFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 2, WEST SOCKET

SCALE: 1"=1'

SPEC. NO.

DATE

APRIL 1983

DRAWING NUMBER

9687-134/3050

SHEET 24 OF 32

ROCK SOCKET ROLLOUT-SCALE 1"=1'

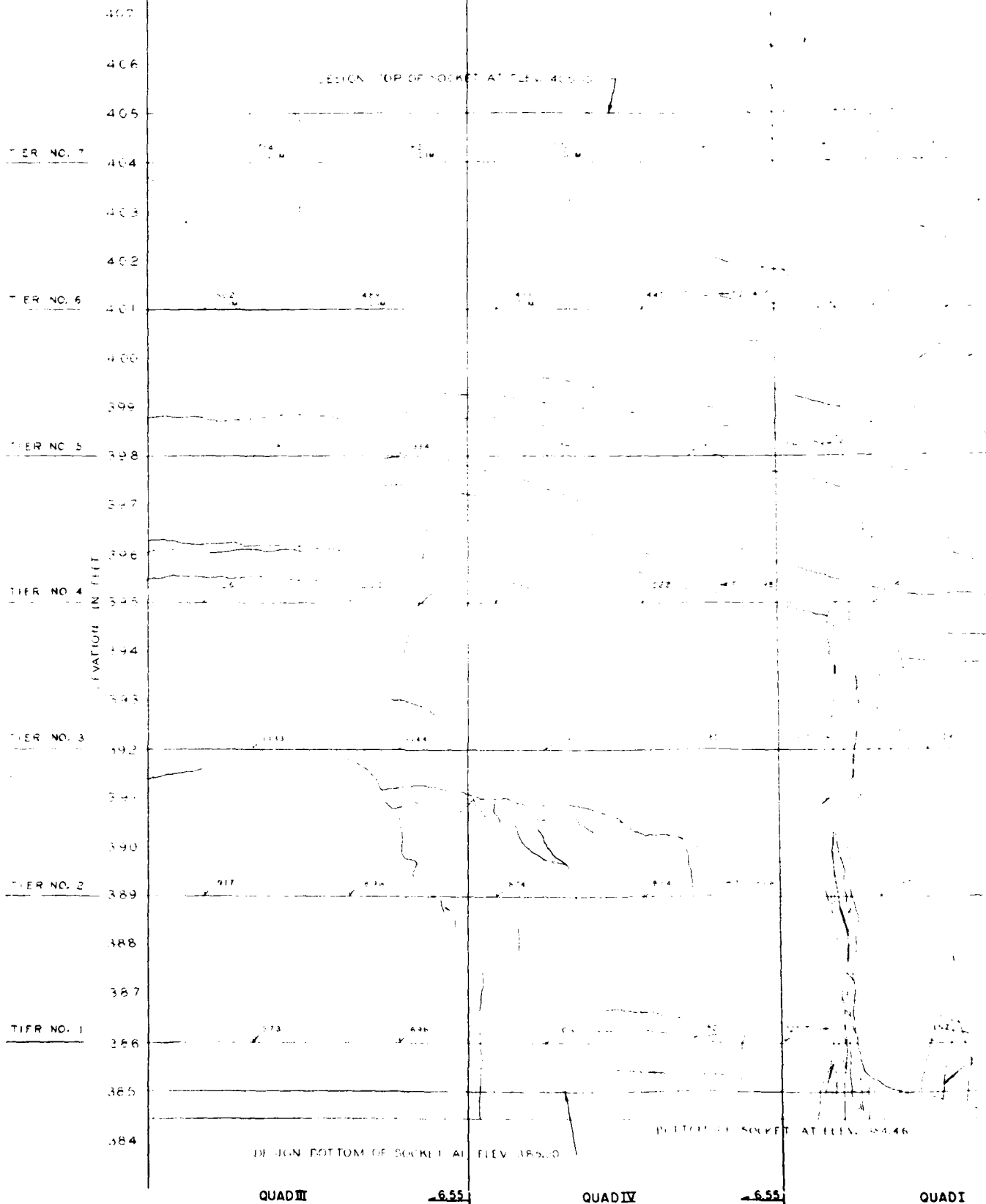
QUAD I

QUAD II

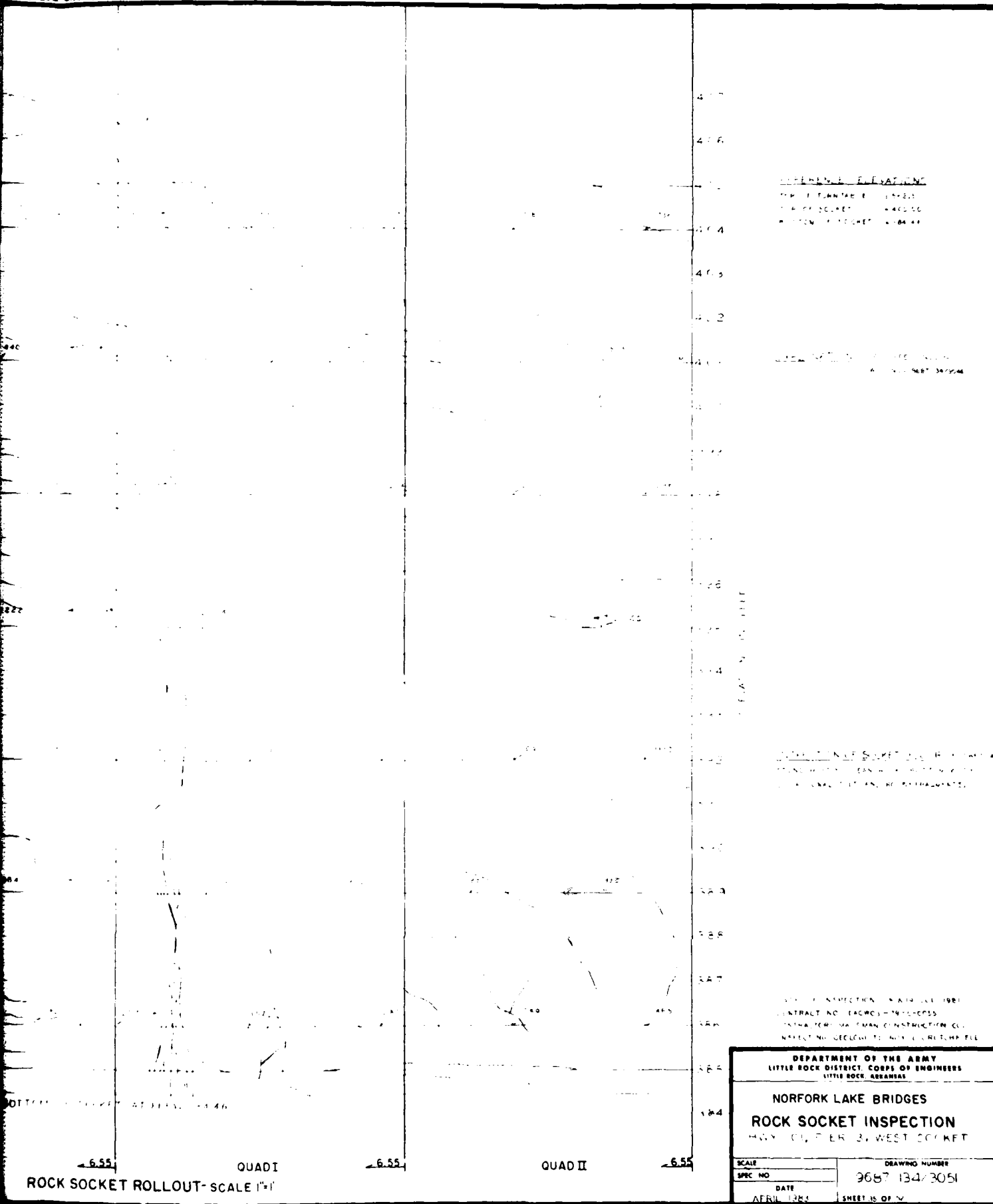
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WORK SAFELY



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ROCK SOCKET ELEVATIONS

TOP OF TANKAGE 41.20
 TOP OF SOCKET 41.40
 BOTTOM OF SOCKET 41.64

SEE NOTE 1 FOR DETAILS
 ALL DIMENSIONS IN FEET

ROCK SOCKET INSPECTION
 (SEE NOTE 1 FOR DETAILS)
 ALL DIMENSIONS IN FEET

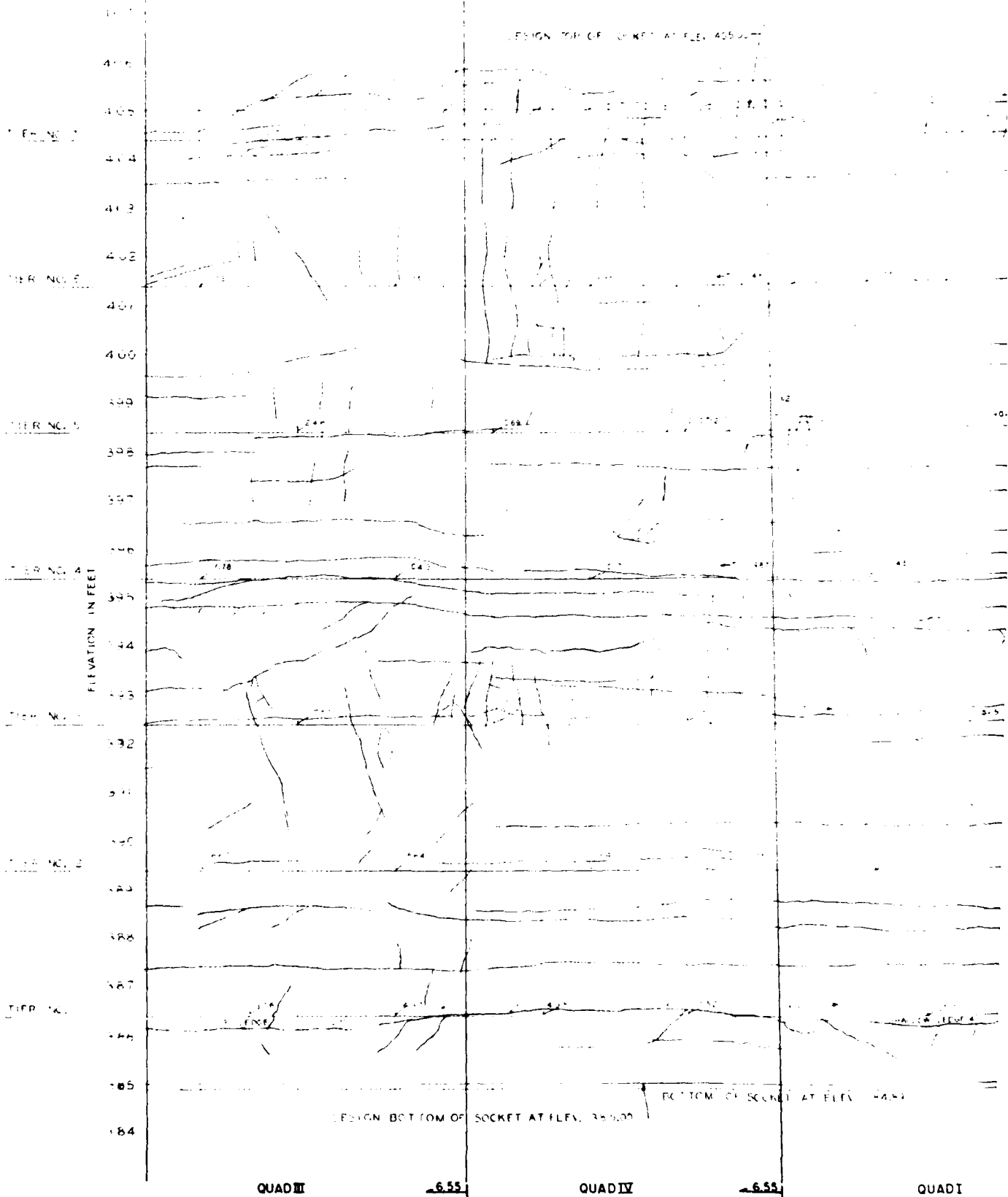
INSPECTION IN APRIL 1981
 CONTRACT NO. 14CWC1-1971-003
 CONTRACTOR: HAN CONSTRUCTION CO.
 PROJECT NO. 9687-1347-3051

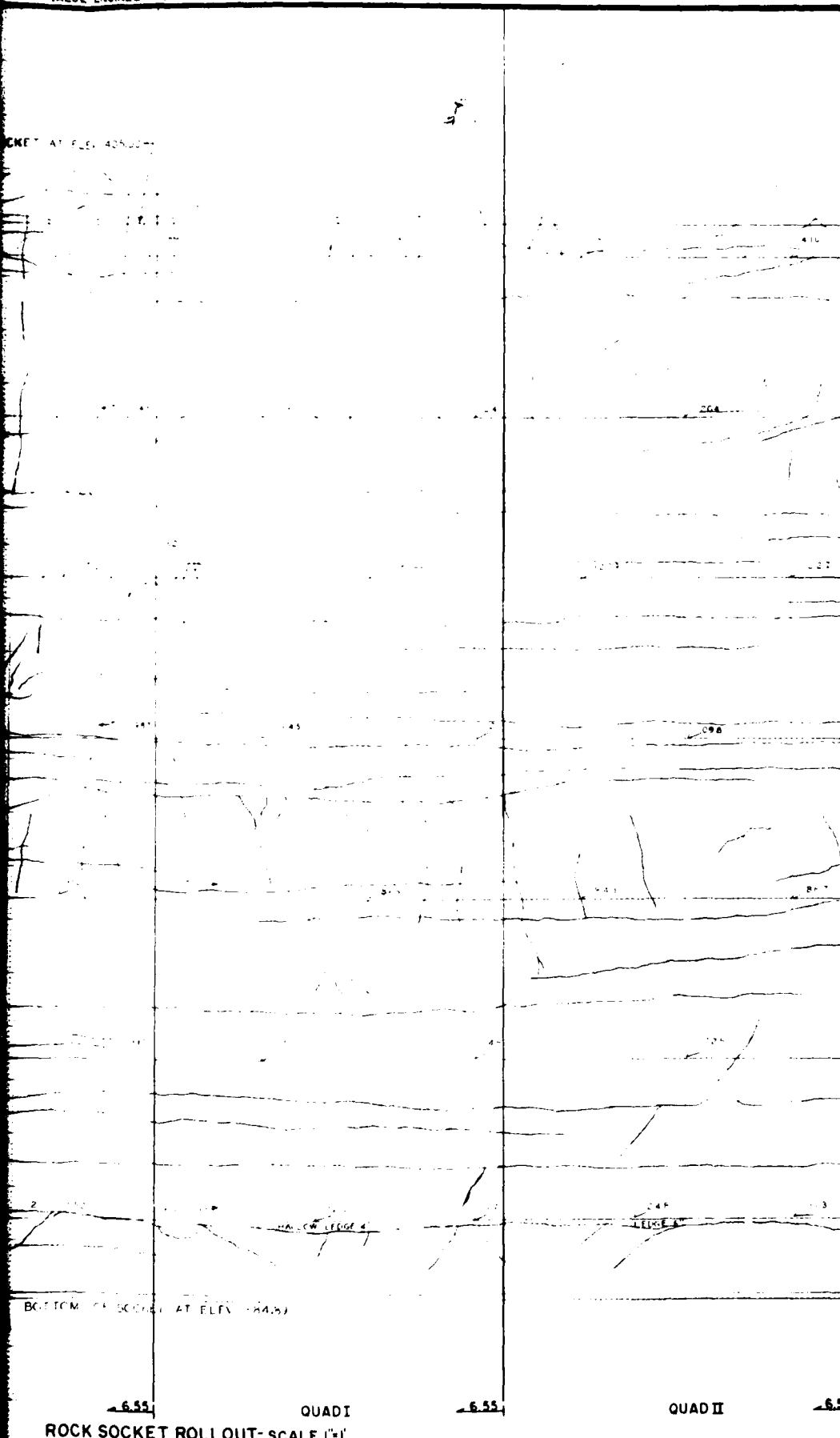
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| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFORK LAKE BRIDGES ROCK SOCKET INSPECTION HWY. 101, PIER 3, WEST SOCKET | |
| SCALE SPEC. NO. DATE APRIL 1981 | DRAWING NUMBER 9687-1347-3051 SHEET IS OF 12 |

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WORK SAFELY





REFERENCE ELEVATIONS

TOP OF SOCKET = 409.50
BOTTOM OF SOCKET = 184.89

EXPLANATION, SEE SHEET NO. 30
DWG. NO. 5687-134/3046

INSPECTION OF SOCKET FLOOR, SHOWED A
SMOOTH, SOUND ROCK BOTTOM WITH OCCASIONAL
SMALL AMOUNTS OF SAND AND GRAVEL.

DATE OF INSPECTION: 21 & 22 JUL 1981
CONTRACT NO.: LAGWC3 79-C-0055
CONTRACTOR: WASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 3, EAST SOCKET

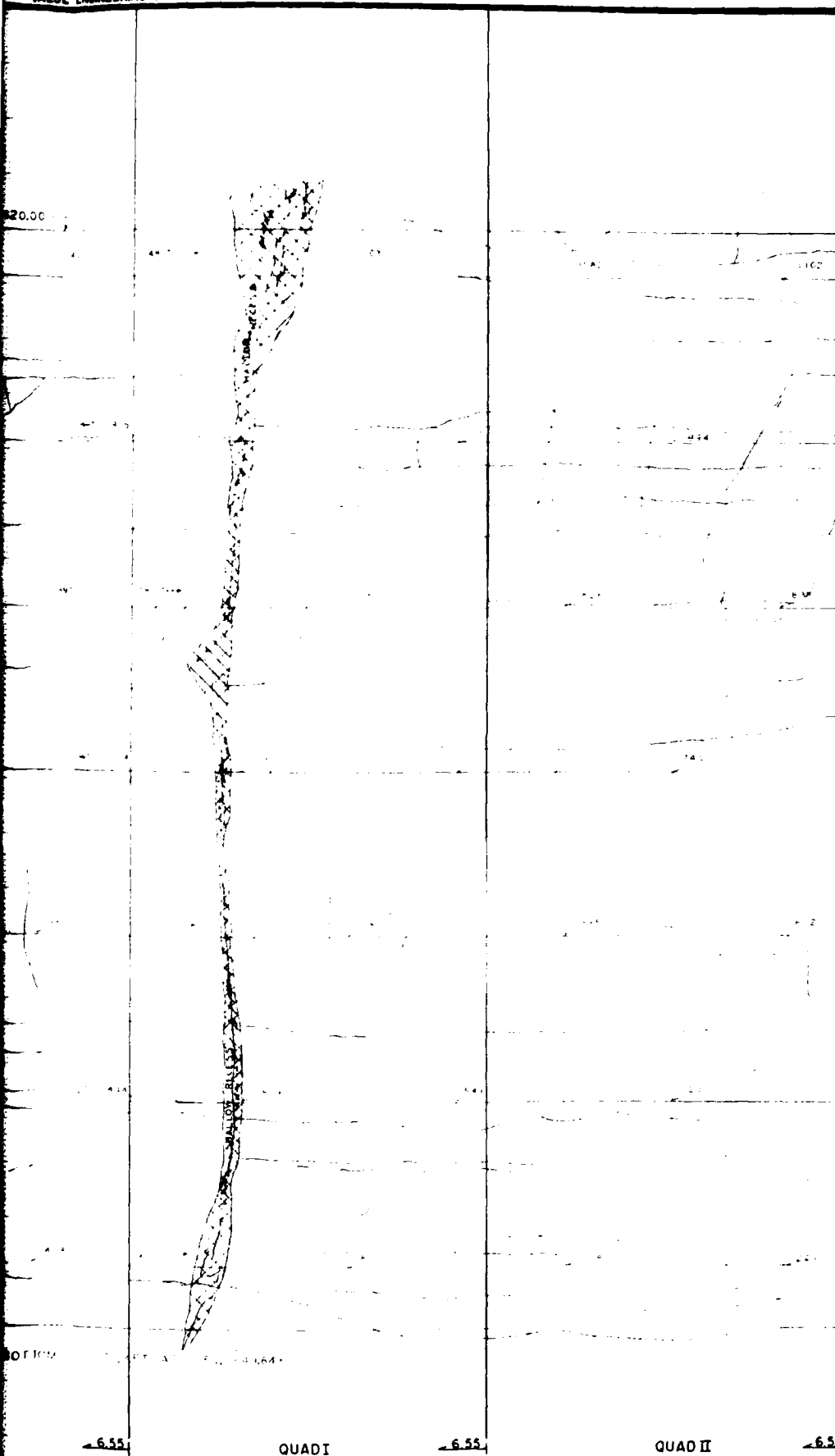
SCALE: 1" = 1'

SPEC. NO.

DATE
APRIL 1983

DRAWING NUMBER
9687-134/3052
SHEET NO. OF 32

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| INVESTMENT | |
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| INVESTMENT IN TAXABLE | 199.64 |
| INVESTMENT IN TAXABLE | 420.00 |
| INVESTMENT IN TAXABLE | 199.64 |

EXPLANATION SEE SHEET NO. 8
E.A. NO. 9687-134/2046

THE UNIVERSITY OF CHICAGO PRESS

[illegible]

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
DAY, 1984, 10:00 AM

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| SCALE | DRAWING NUMBER |
| SPEC NO | 9687-134/3053 |
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| AUG 1984 | SHEET 1 OF 1 |

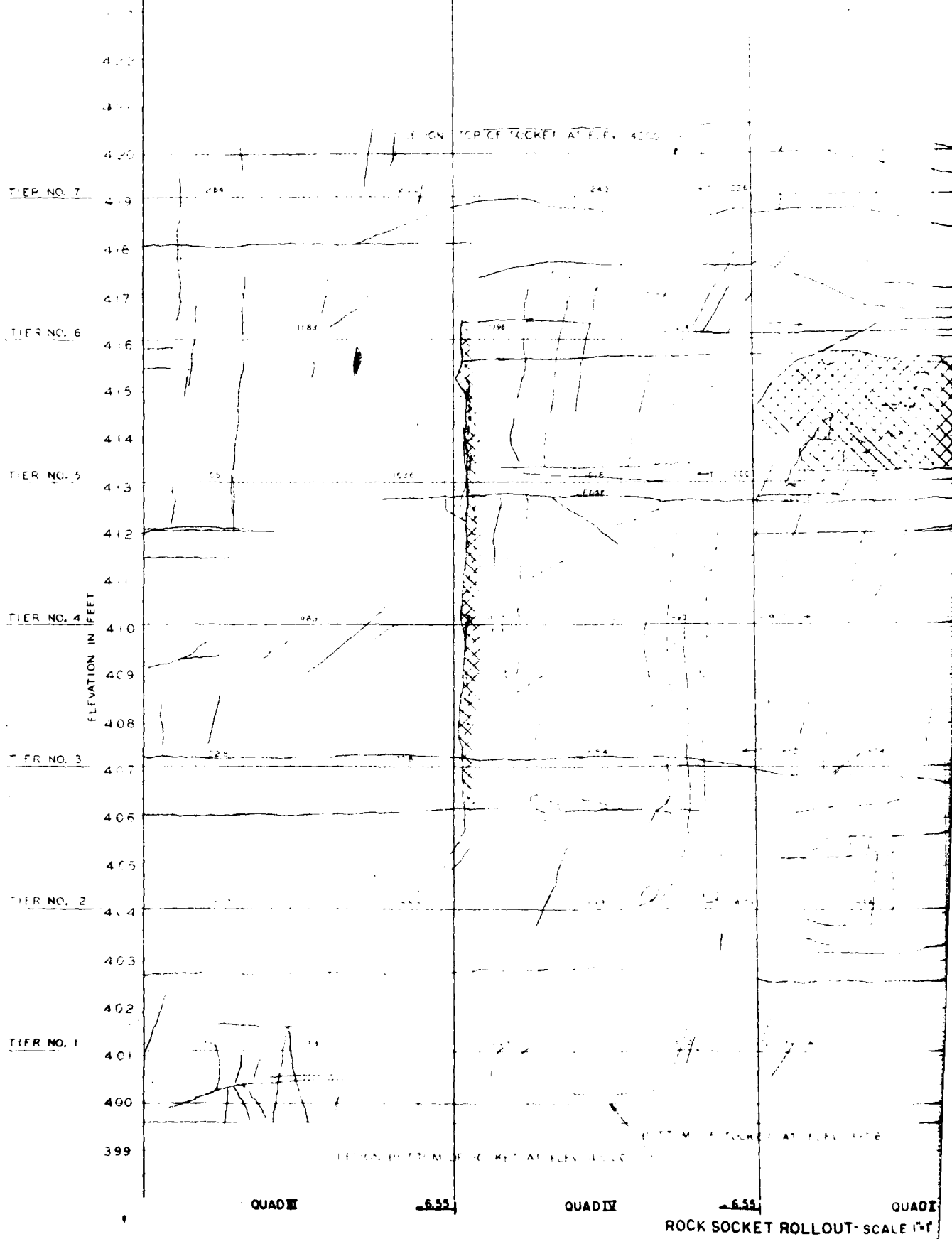
6.55 QUADI
ROCK SOCKET ROLLOUT- SCALE 1"=1'

QUAD II

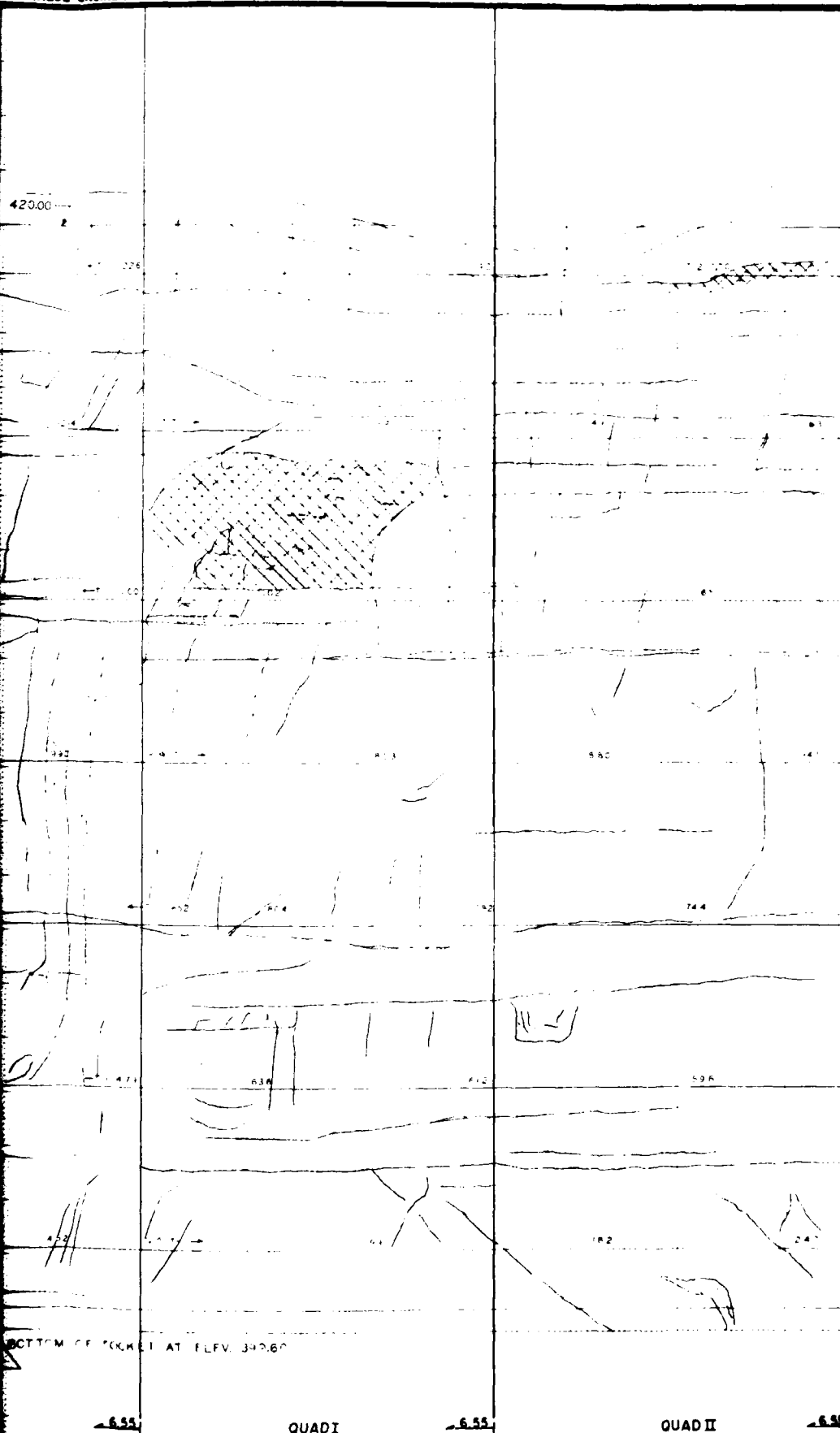
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WORK SAFETY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF TURNABLE = 420.00
 TOP OF SOCKET = 420.00
 BOTTOM OF SOCKET = 399.80

EXPLANATION, SEE SHEET NO. 30
 WS. NO. 9687-34/3046

INSPECTION OF SOCKET FLOOR, SHOWED A
 CLEAN, SOUND ROCK BOTTOM.

DATE OF INSPECTION: 29 AUG 1984
 CONTRACT NO: DACW01-79-C-0055
 CONTRACTOR: MASSMAN CONSTRUCTION CO
 INSPECTING GEOLOGIST: ROY L. KILGENTHIE

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|---|----------------|
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT, CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFOLK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| NORFOLK LAKE BRIDGE, EAST SOCKET | |
| SCALE | DRAWING NUMBER |
| SPEC NO. | 9687-134/3054 |
| DATE | |
| APRIL 1985 | SHEET 38 OF 42 |

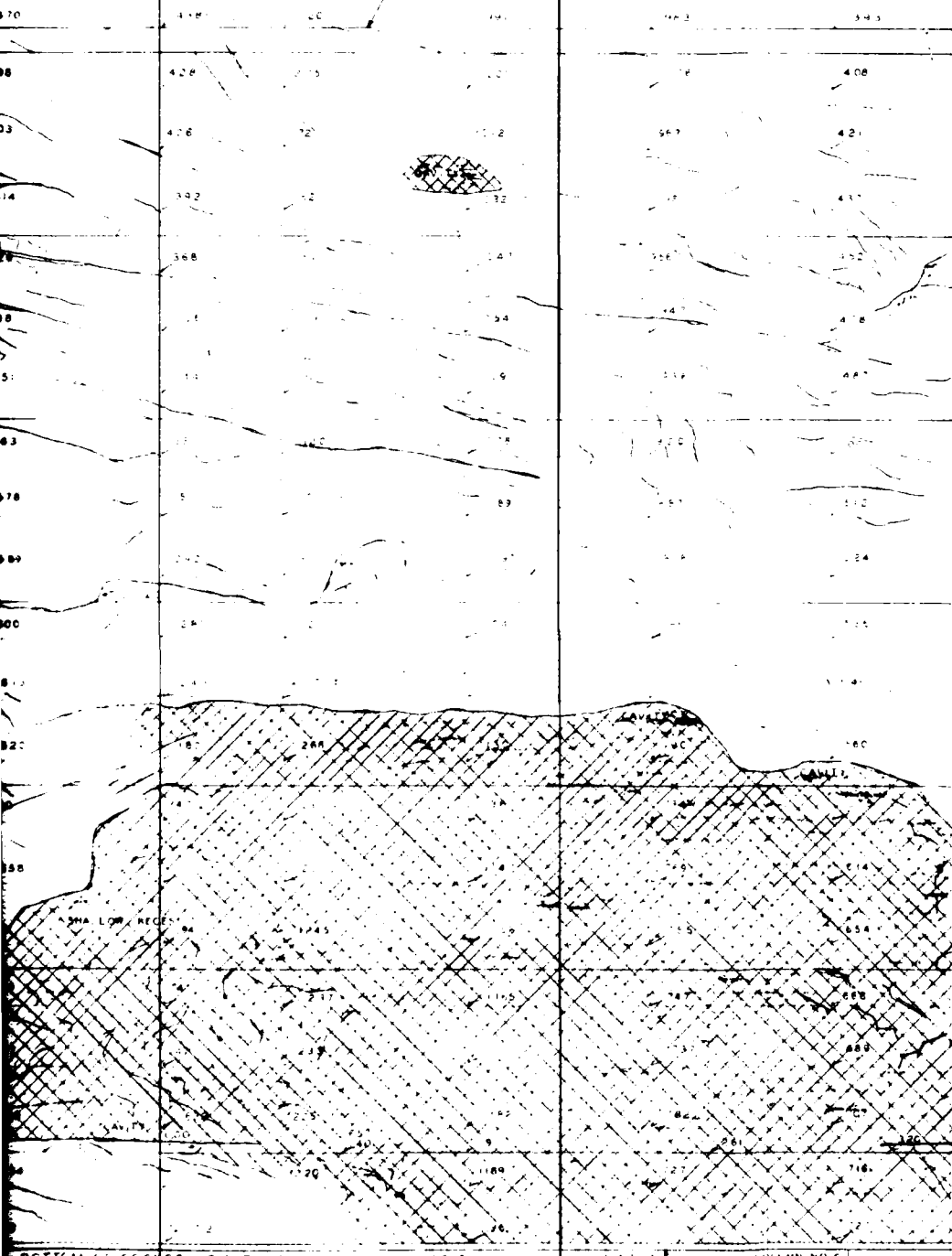
6.55' QUAD I
 ROCK SOCKET ROLL-OUT- SCALE 1"=1'

QUAD II



WORK SAFELY

DESIGN TOP OF SOCKET AT ELEV. 416.00



BOTTOM OF SOCKET AT ELEV. 396.00

ROCK SOCKET ROLLOUT-SCALE 1"=1'

QUAD I

QUAD II

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ELEVATION IN FEET

REFERENCE ELEVATIONS

TOP OF TURN-TABLE +162.5
TOP OF SOCKET +420.00
BOTTOM OF SOCKET +396.00
DESIGN TOP OF SOCKET +416.00

EXPLANATION SEE SHEET NO. 30
DWG. NO. 9687-34/3048

INSPECTION OF SOCKET FLOOR SHOWED A
CRACKY, BUT SOUND ROCK BOTTOM WITH
SOME SAND AND SMALL FRAGMENTS.

DEPTH OF SOCKET INSPECTION, TO 10 FEET
ELEVATION SHOWN ON SHEET NO. 40
DWG. NO. 9687-34/3056

DATE OF INSPECTION: 11 APR 1983
CONTRACT NO. DAAK01-83-1-0000
CONTRACTOR: MA. MAN. CONSTRUCTION CO.
INSPECTING OFFICER: COL. C. R. HOFFER

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 5, WEST SOCKET

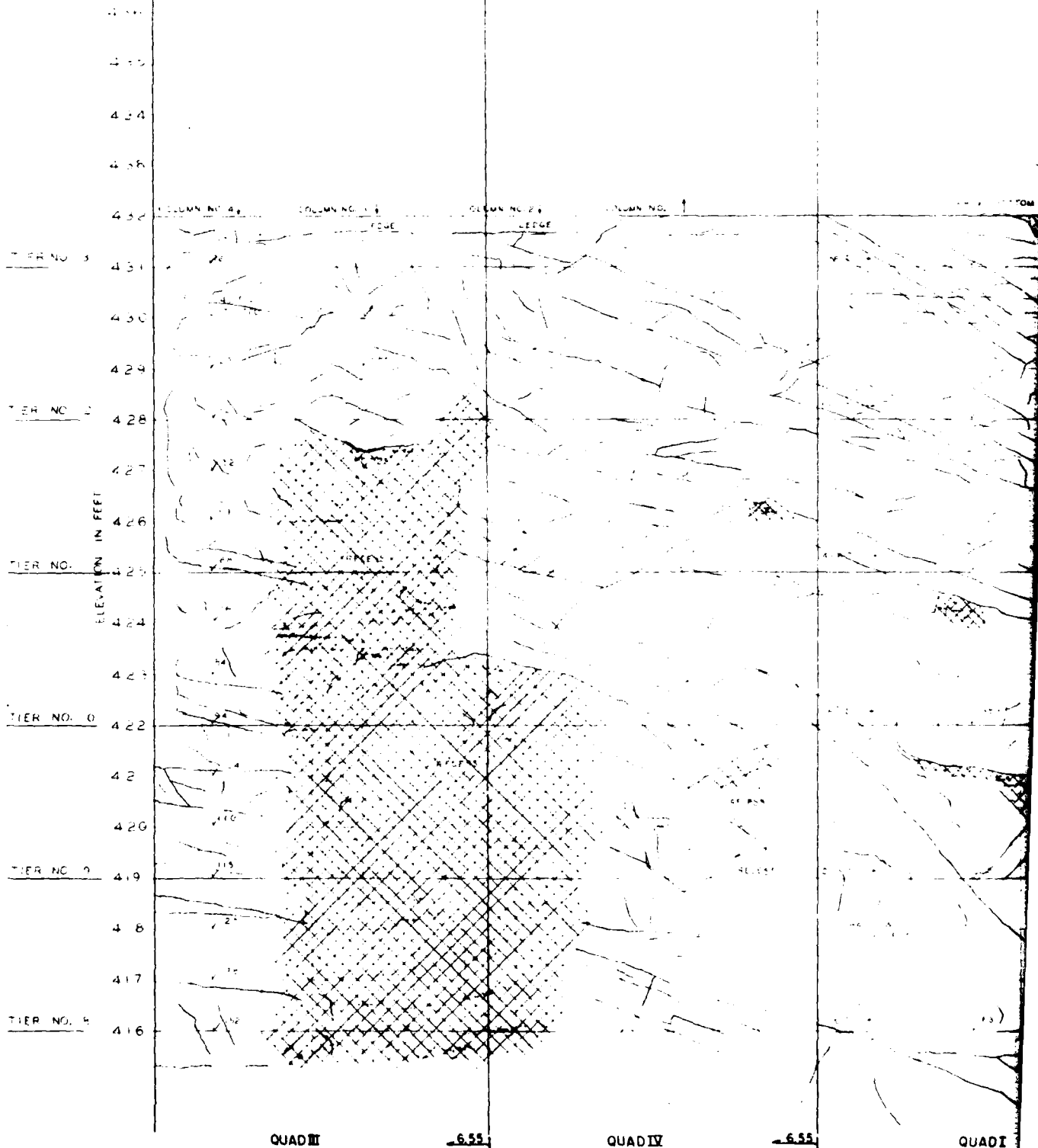
SCALE: 1"=1'
SPEC. NO.
DATE
APRIL 1983

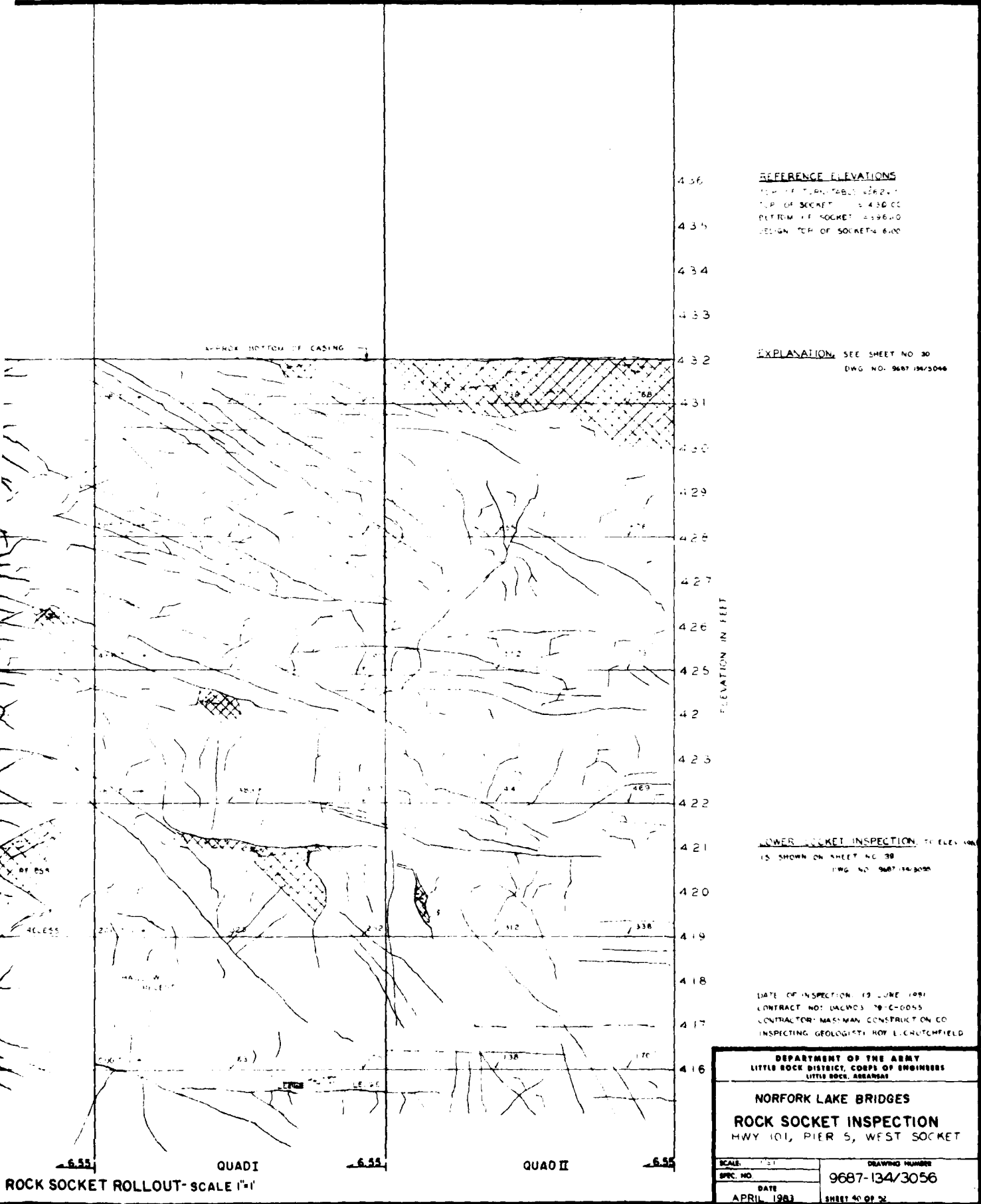
DRAWING NUMBER
9687-134/3055
SHEET 30 OF 32

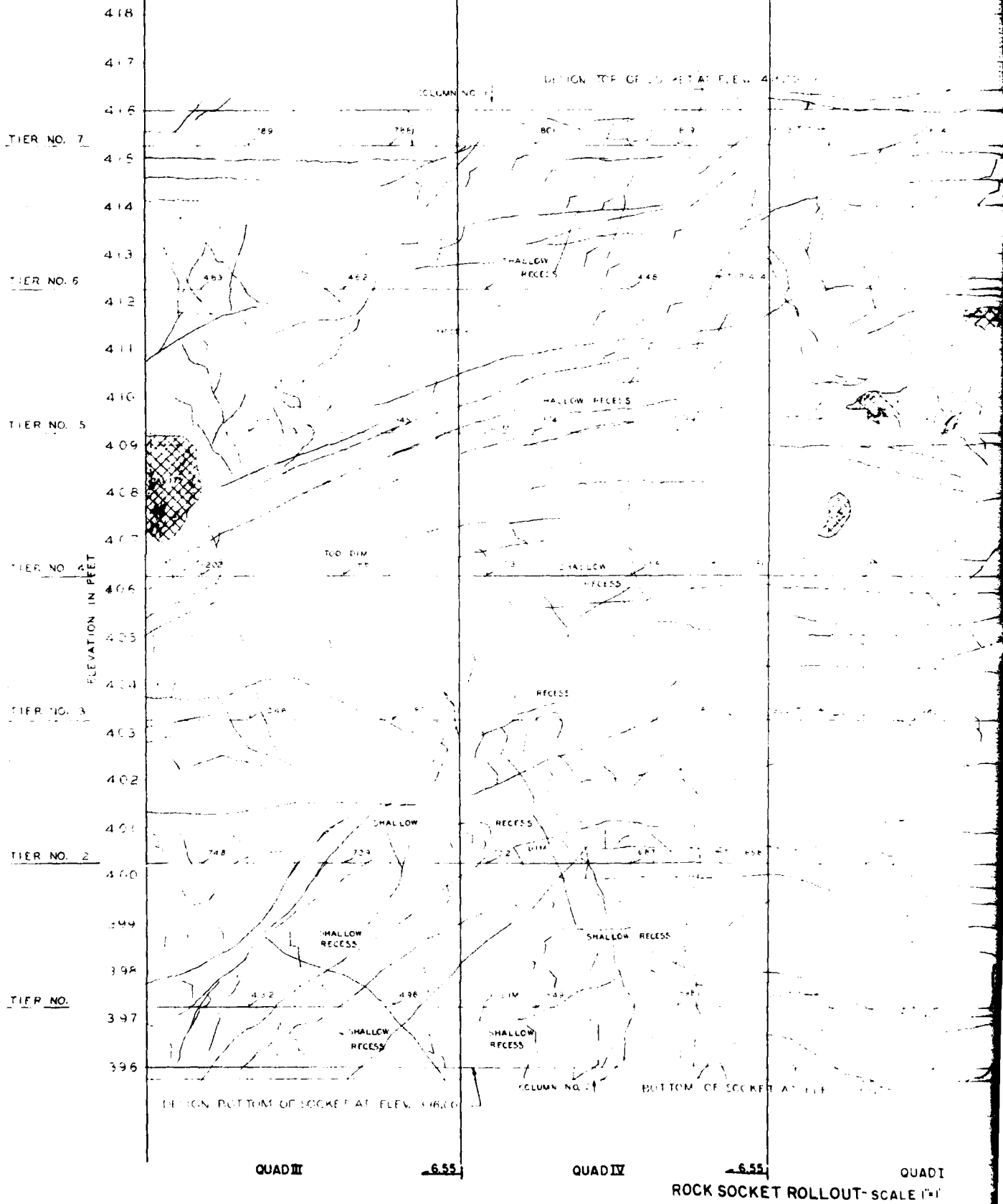
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WORK SAFELY







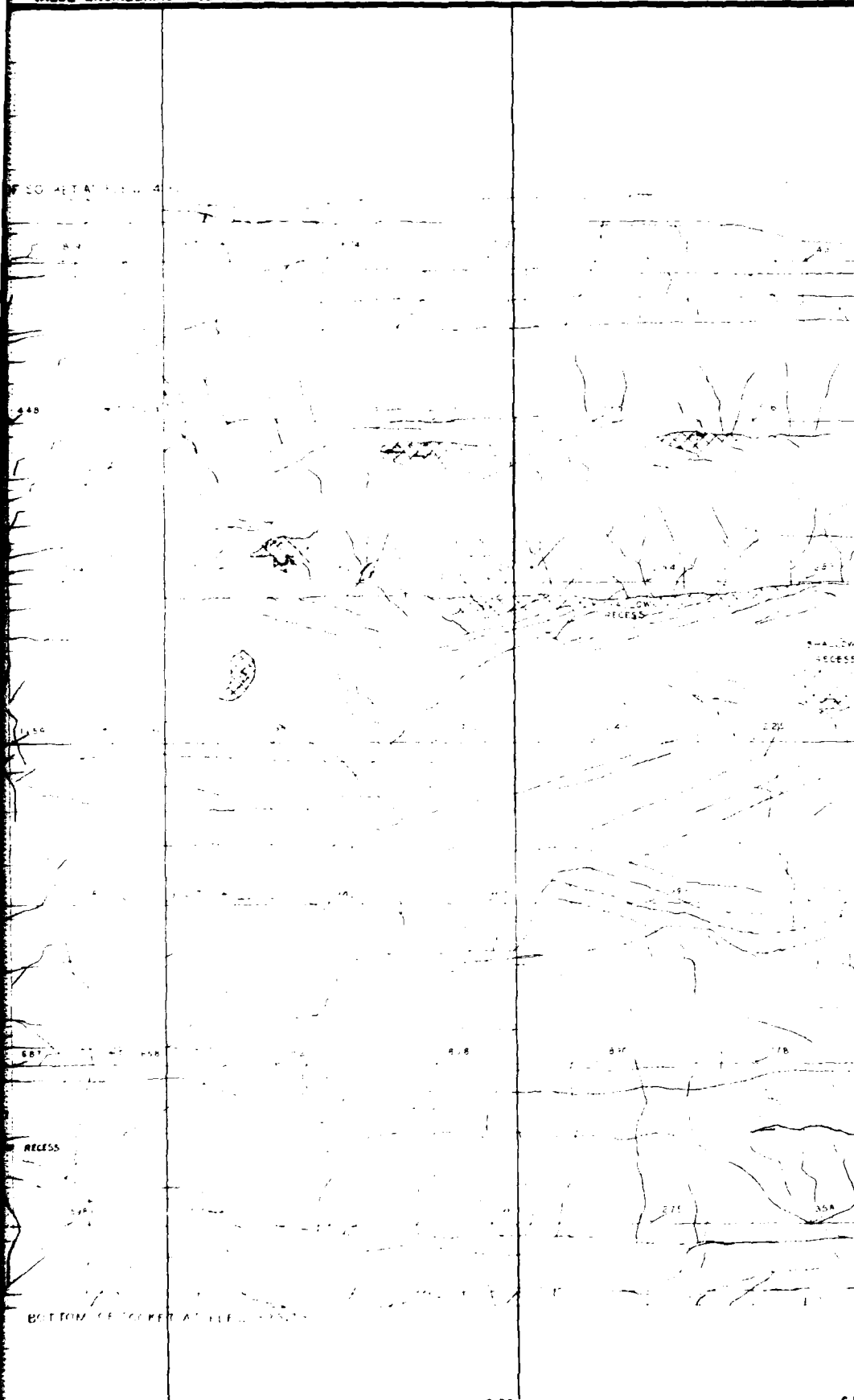
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| WALL | ROCK | SOCKET | ROLLOUT | SCALE | 1\"/> |
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| WALL | ROCK | SOCKET | ROLLOUT | SCALE | 1\"/> |
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WORK SAFELY

ROCK SOCKET ROLLOUT-SCALE 1"

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF TURNABLE PLATE
TOP OF SOCKET 4136.00
BOTTOM OF SOCKET 395.75
DESIGN TOP OF SOCKET 416.00

EXPLANATION SEE SHEET NO. 35

WD. NO. 9687-134/3046

INSPECTION OF SOCKET PLUG SHOWED A
CLEAN SOUND ROCK BOTTOM, BUT SOME
FRACTURED AND BLOCKY

DEPTH SOCKET INSPECTION, TO ELEV.

411.5 - SHOWN ON SHEET NO. 42
WD. NO. 9687-134/3058

DATE OF INSPECTION: 15 JUNE 1988
CONTRACT NO. DAHWA-17-00-00-00-00
CONTRACTOR: MADSWAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 5, EAST SOCKET

SCALE: 1"=1'
SPEC. NO.
DATE
APRIL 1983

DRAWING NUMBER
9687-134/3057
SHEET 4 OF 5

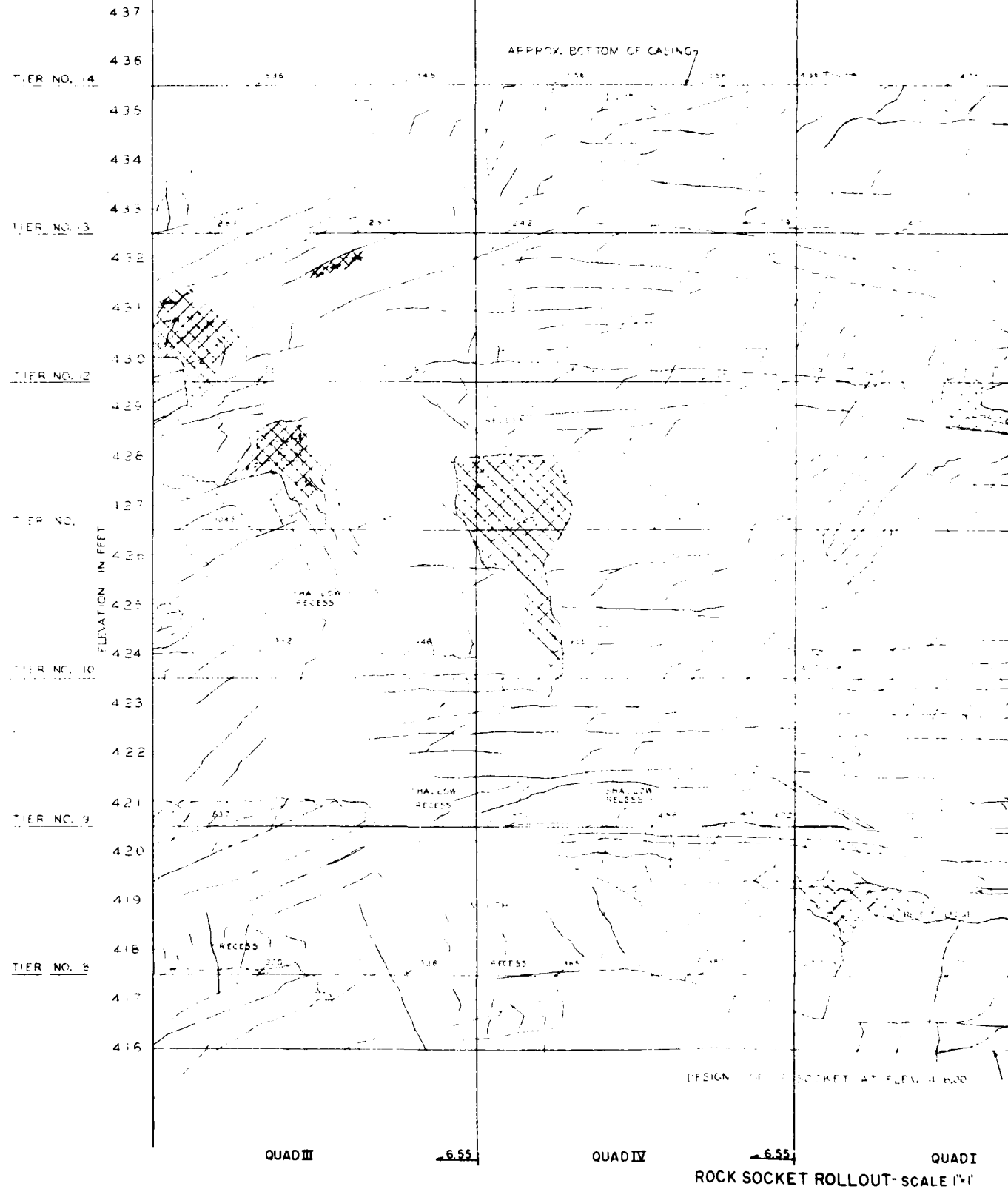
ROCK SOCKET ROLLOUT-SCALE 1"=1'

QUAD II

| DATE | |
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| BY | |
| REVIEWED | |
| APPROVED | |
| DATE | |
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WORK SAFELY



PLASING



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QUAD II
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ROCK SOCKET ROLLOUT- SCALE 1"=1'

| TABLE 1.1 | |
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| DESIGN TOP OF SOCKET | |
| DESIGN TOP OF SOCKET | 4.10 15 |
| DESIGN TOP OF SOCKET | 4.95 15 |
| DESIGN TOP OF SOCKET | 4.10 15 |

THE ATLANTA, 42 WEST 10TH ST.
N. W. 4057 46 3146

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
DATE 05-11-2004 BY 60322 UCBAW

DATE OF DEPARTURE: 11/19/88
 AIRLINE: DALY 19-0055
 AIRCRAFT: BOEING 747-200
 AIRLINE: DALY 19-0055
 AIRCRAFT: BOEING 747-200

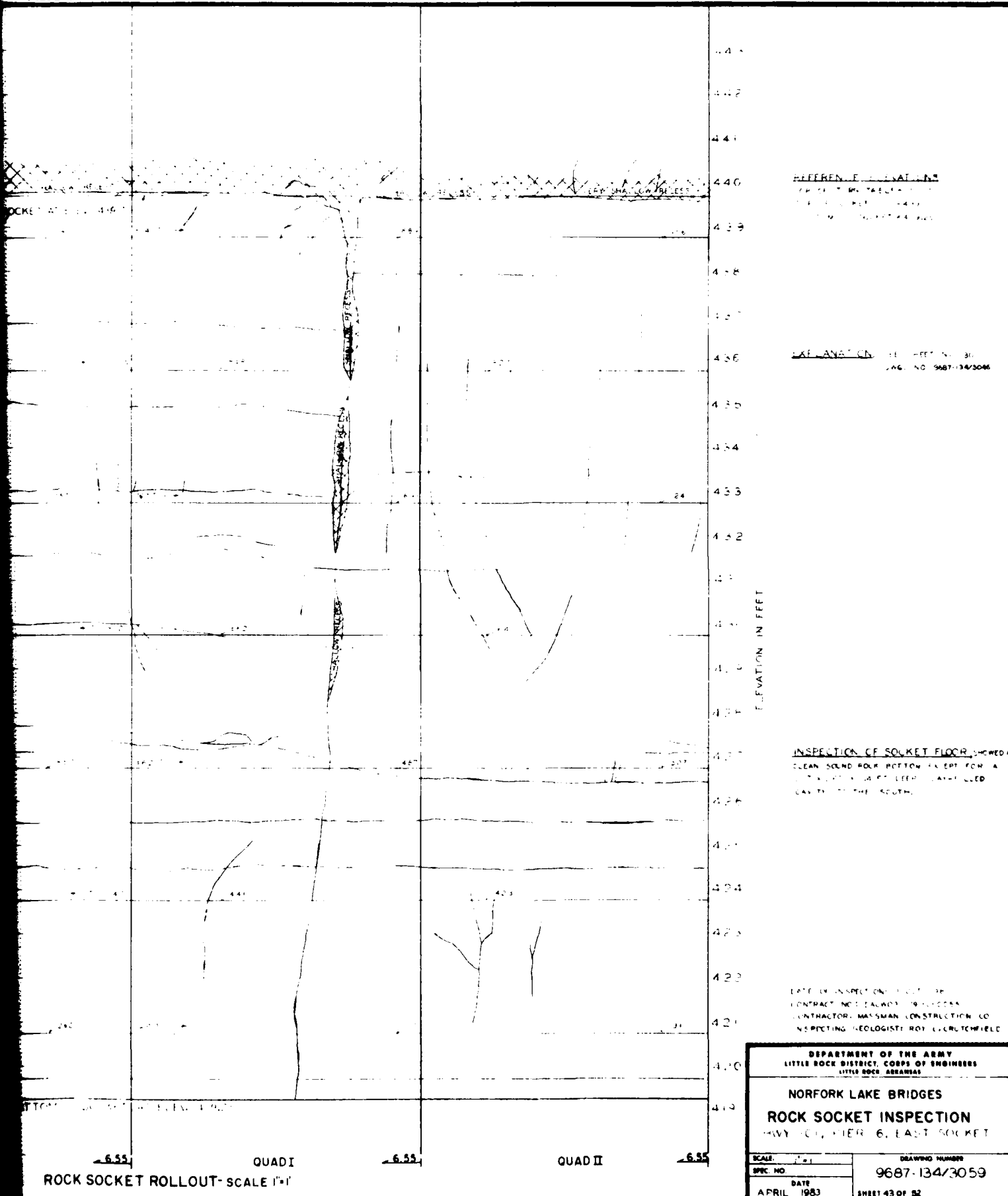
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 5, EAST SOCKET

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| SCALE | DRAWING NUMBER |
| SPCC NO | 9687-134/3058 |
| DATE | |
| APRIL 1984 | SHEET 4/ OF 52 |

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

CHISEL POINT BRIDGE
 ROCK SOCKET ELEV. 444.1
 FROM THE SURFACE OF THE ROCK

EXPLANATION

SEE SHEET NO. 30
 DWG. NO. 9687-134/3046

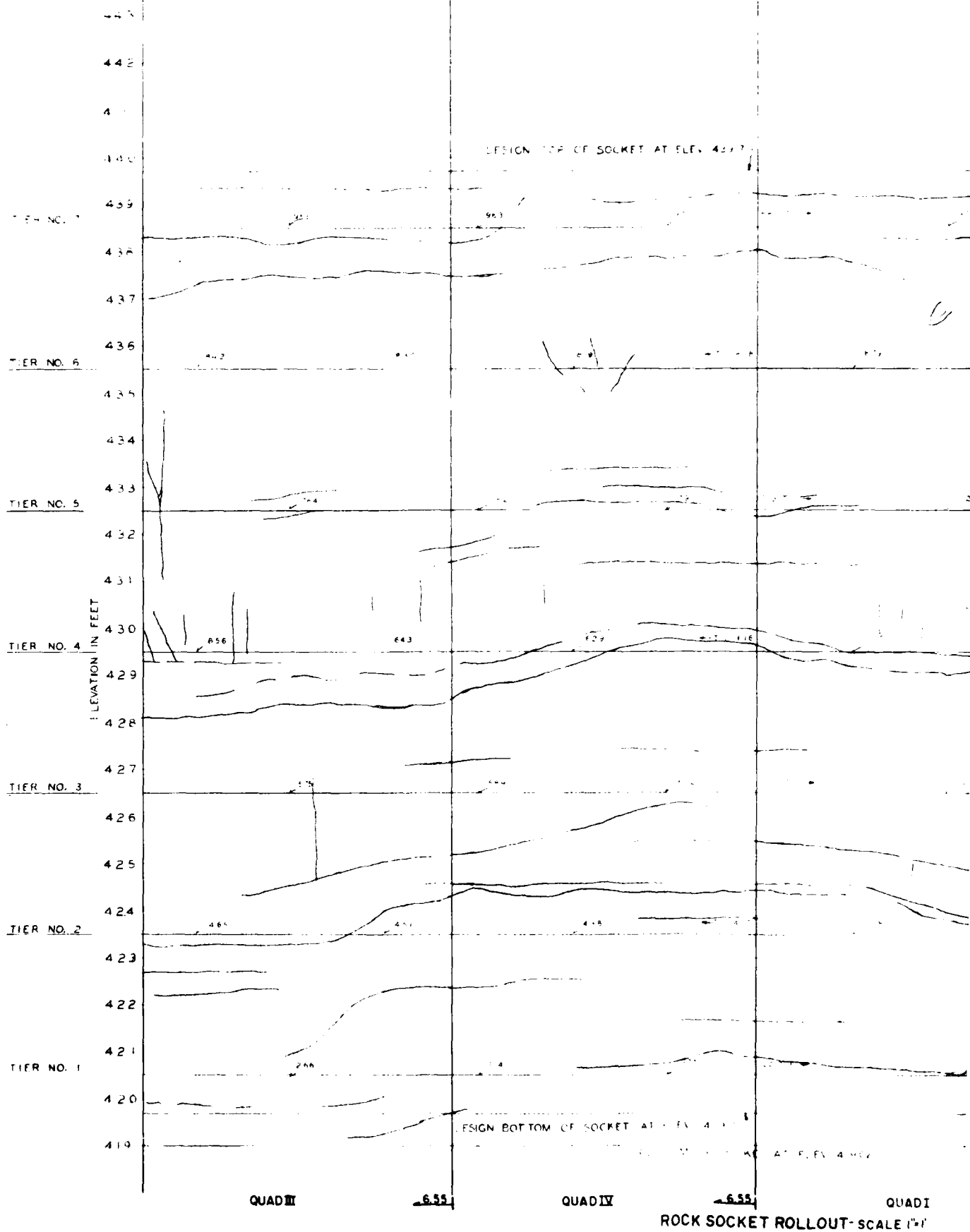
INSPECTION OF SOCKET FLOOR SHOWED
 CLEAN SOUND ROCK BOTTOM EXCEPT FOR A
 CRACK ABOUT 1/2" WIDE DEEP, LOCATED
 ABOUT 10' TO THE SOUTH.

DATE OF INSPECTION: 10/1/82
 CONTRACT NO. 12A001-19-100000
 CONTRACTOR: MASSMAN CONSTRUCTION CO.
 INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

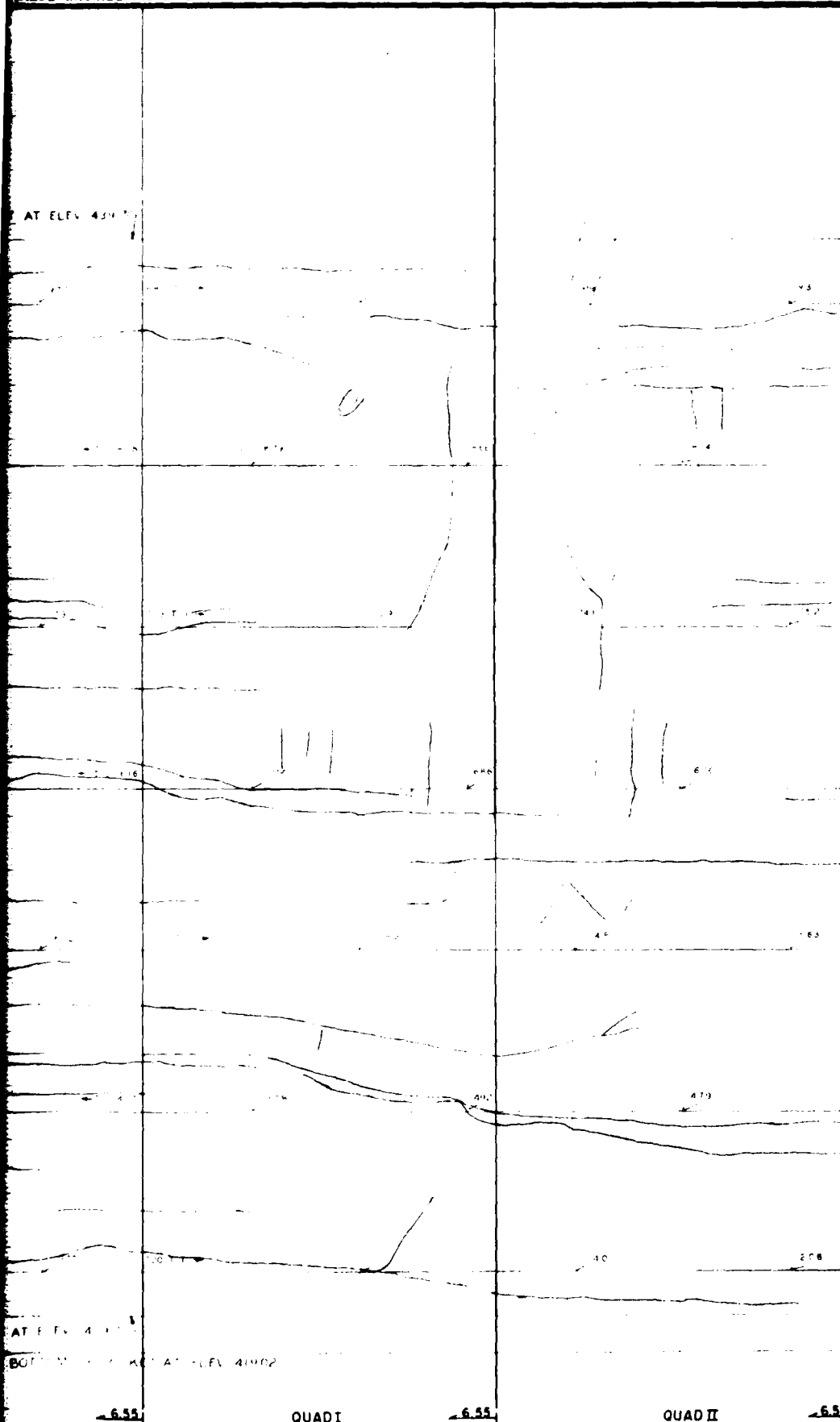
DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
 ROCK SOCKET INSPECTION
 HWY 101, PIER 6, EAST SOCKET

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| SCALE: 1"=1' | DRAWING NUMBER |
| SPEC. NO. | 9687-134/3059 |
| DATE | |
| APRIL 1983 | SHEET 43 OF 52 |



VALUE ENGINEERING WILL INCREASE YOUR PROFIT



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REFERENCE ELEVATIONS
TOP OF TUNNABLE 4337.56
TOP OF SOCKET 4319.77
BOTTOM OF SOCKET 419.902

EXPLANATION SEE SHEET 9687-134/3066
DWG NO. 9687-134/3066

INSPECTION OF SOCKET F.G.O.P. SHOWED A
SOUND ROCK BOTTOM WITH A THIN, WHITE
COVERING OF SILT OVER MUCH OF THE AREA.

DATE OF INSPECTION: 10 OCT 1981
CONTRACT NO: DACW03-79-C-2055
CONTRACTOR: MASSMAN CONSTRUCTION CO
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

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| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT, CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFOLK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| HWY 101, PIER 6, WEST SOCKET | |
| SCALE: 1" = 1' | DRAWING NUMBER |
| SPEC NO. | 9687-134/3060 |
| DATE | |
| APRIL 1983 | SHEET 44 OF 52 |

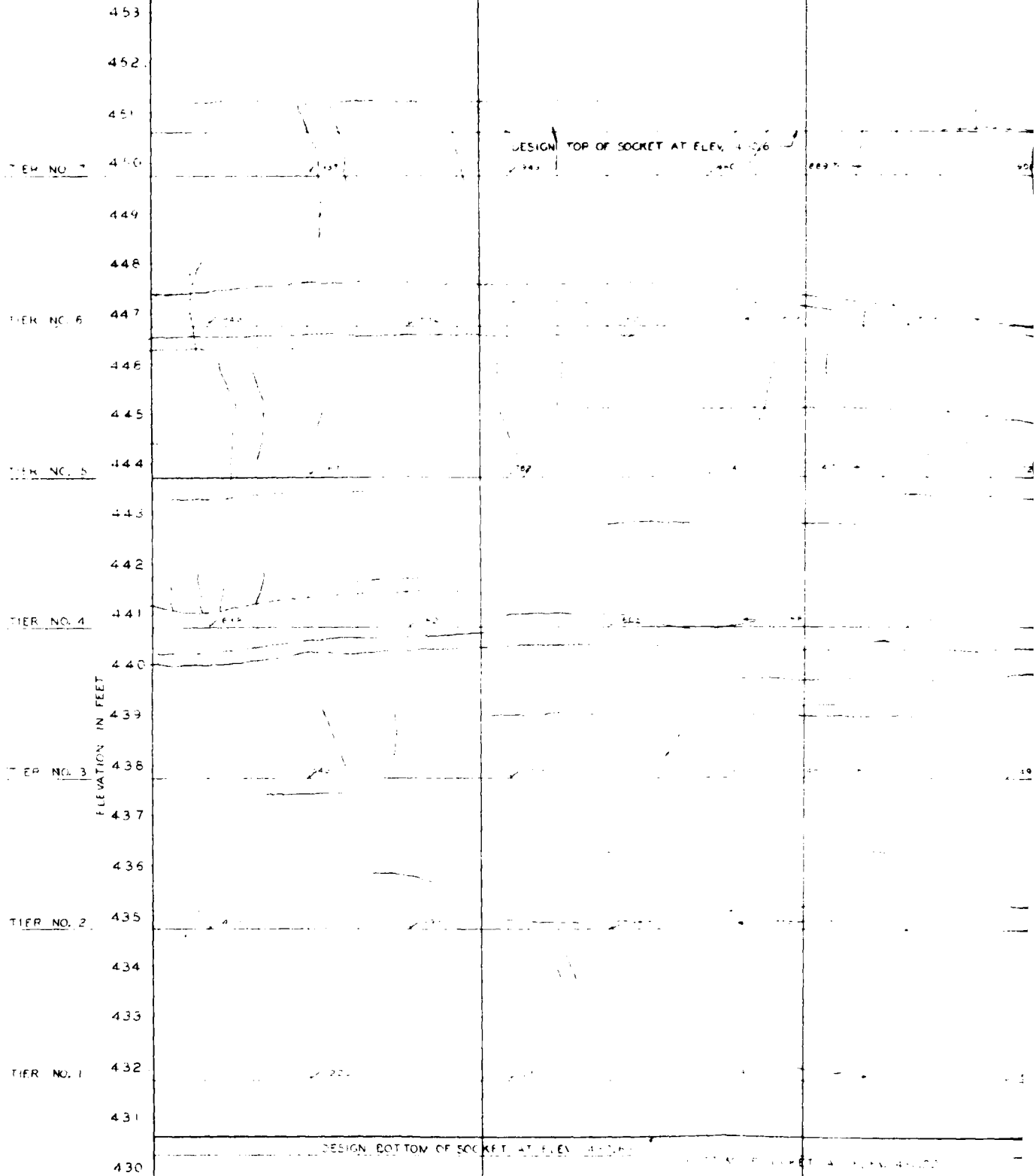
ROCK SOCKET ROLLOUT-SCALE 1"=1"

QUAD II

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WORK SAFELY



QUAD III

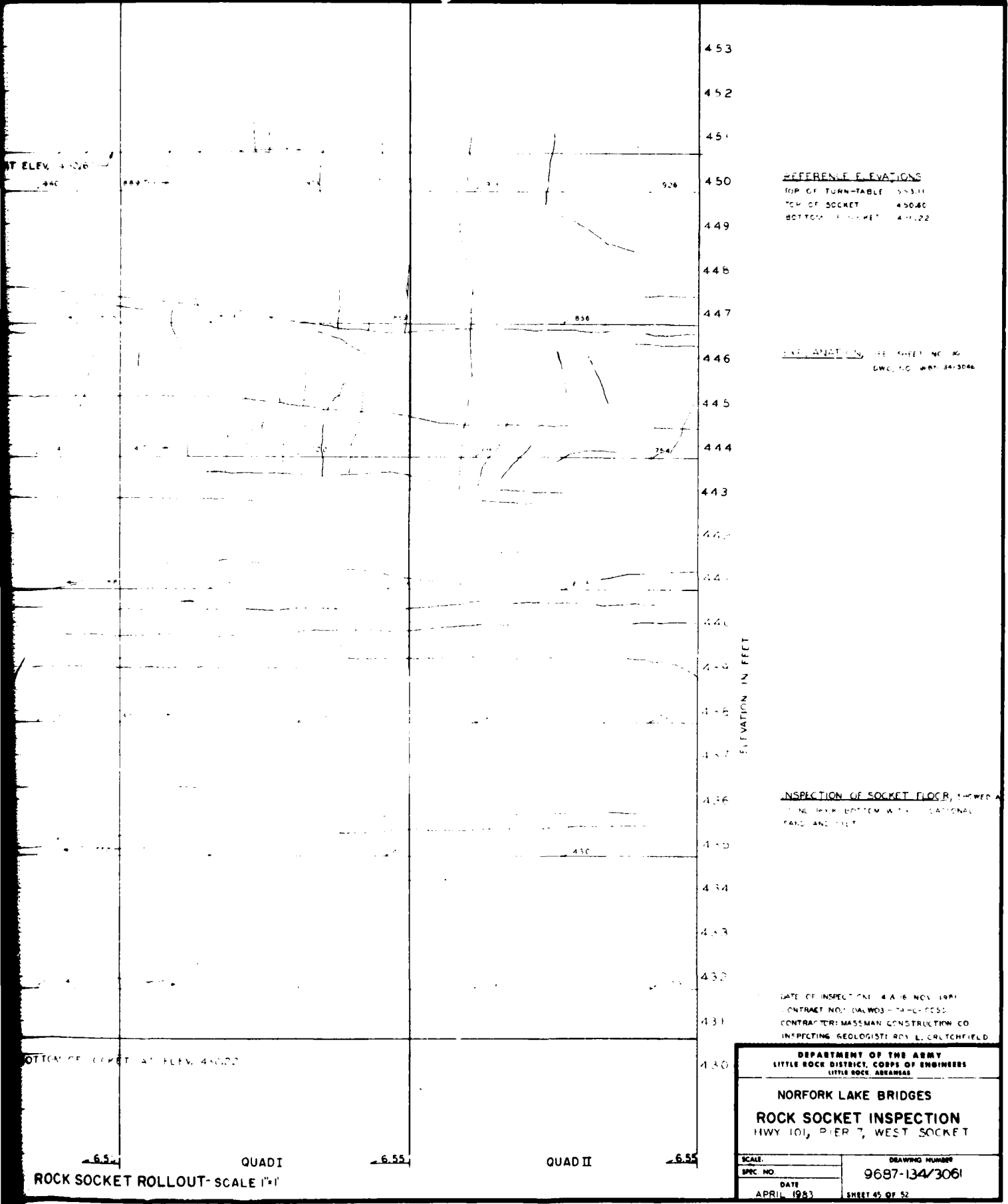
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QUAD IV

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QUAD I

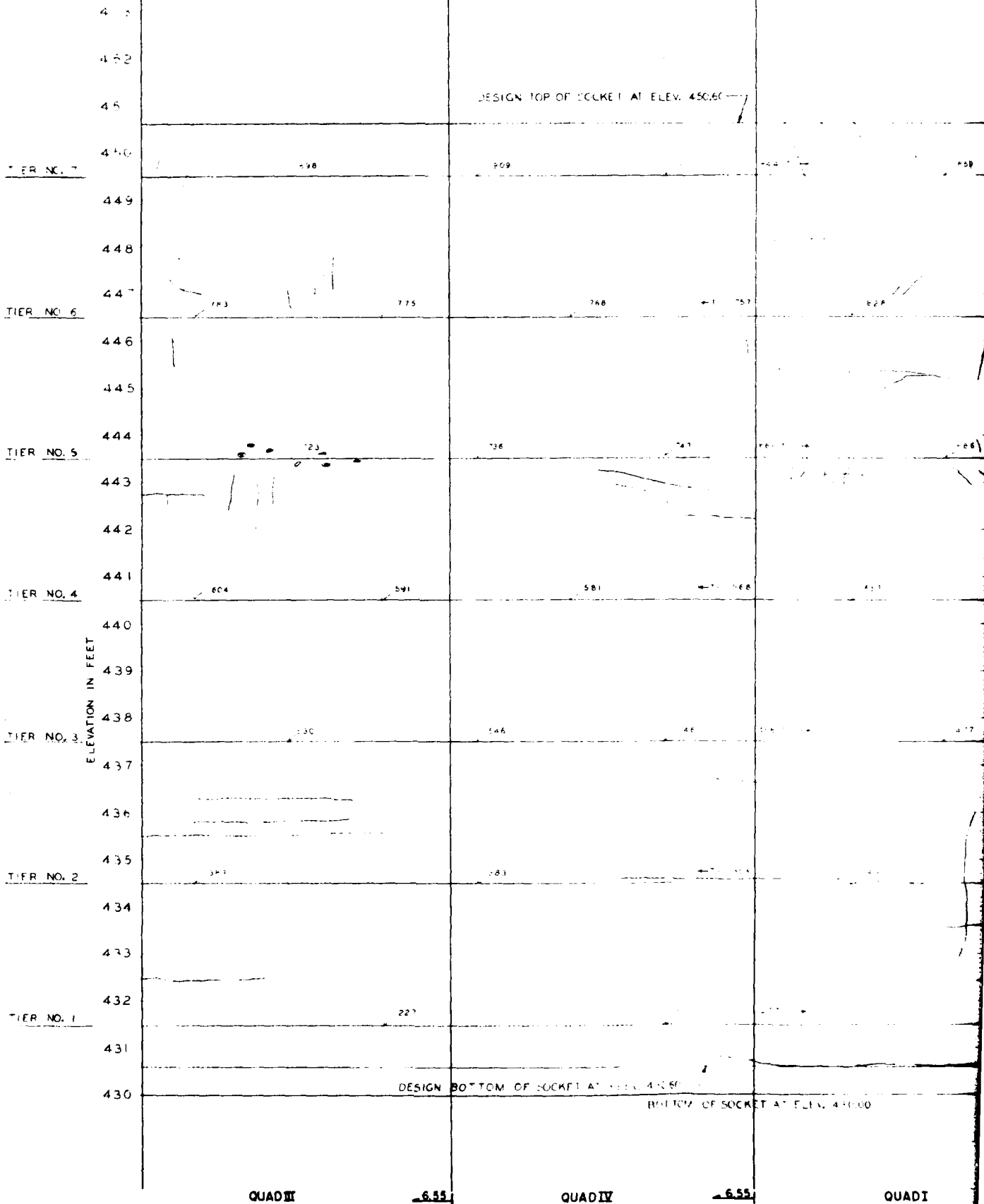
ROCK SOCKET ROLLOUT- SCALE 1"=1'

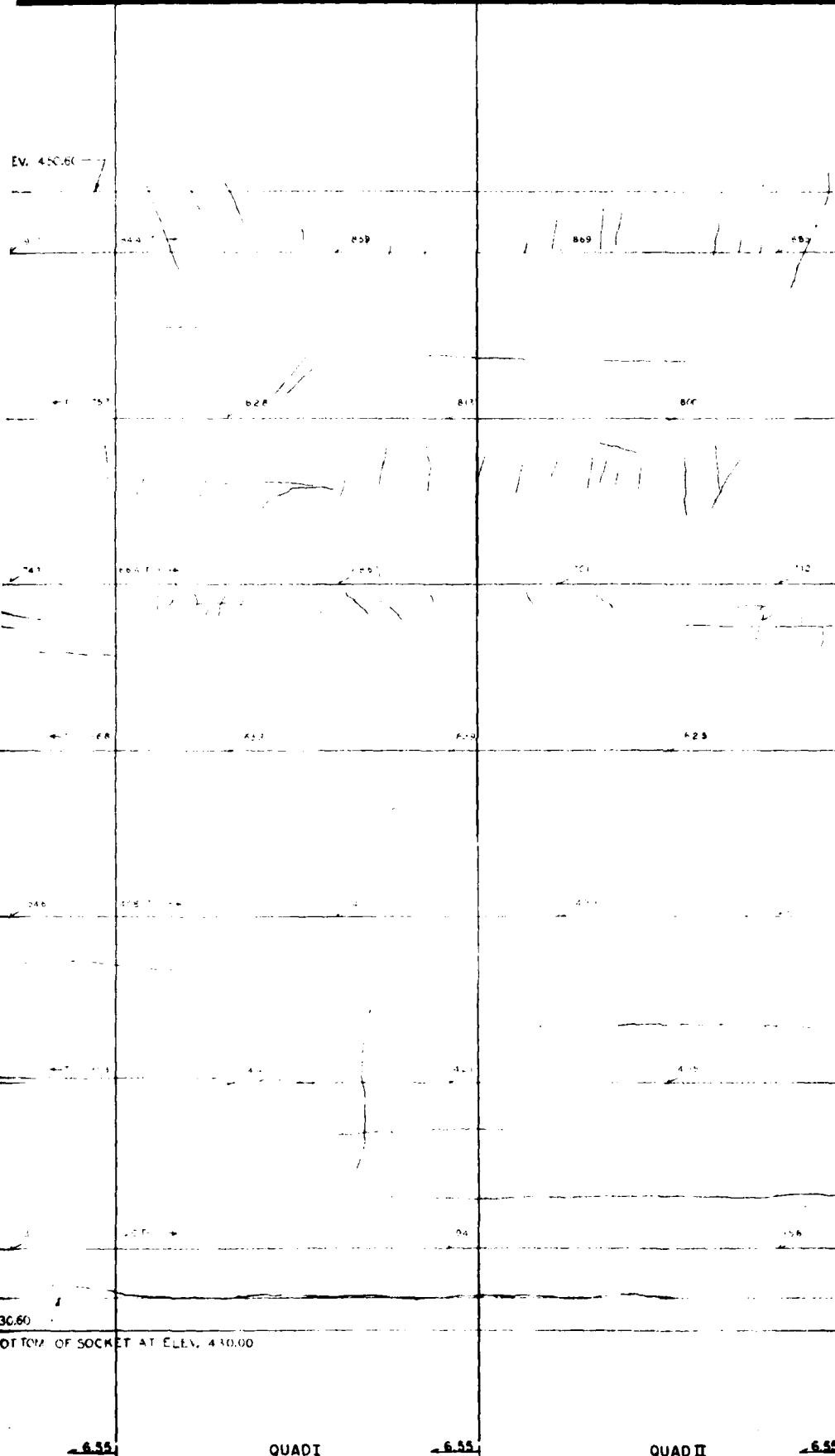


WORK SAFELY

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REFERENCE ELEVATIONS
TOP OF TURN-TABLE 455.15
TOP OF SOCKET 430.60
BOTTOM OF SOCKET 430.00

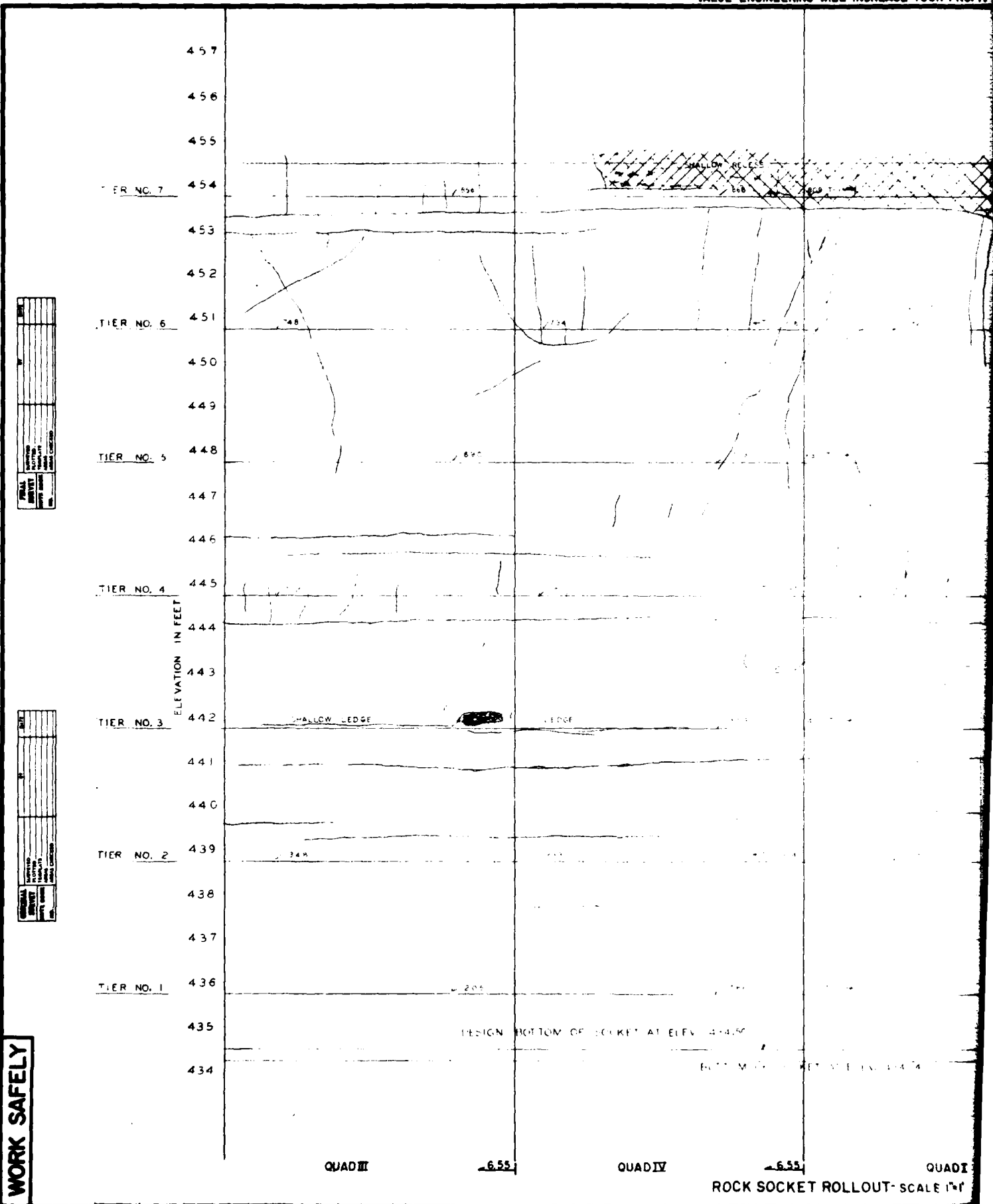
EXPLANATION, SEE SHEET NO. 9687-134/3046

INSPECTION OF SOCKET FLOOR, SHOWED A CLEAN, SOUND ROCK BOTTOM

DATE OF INSPECTION: 14 NOV 1961
CONTRACT NO: DACW03-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

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|---|---|
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT, CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFORK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| PIER 1, EAST TOWER | |
| SCALE: SHEET NO. DATE APRIL 1963 | DRAWING NUMBER 9687-134/3062 SHEET 46 OF 52 |

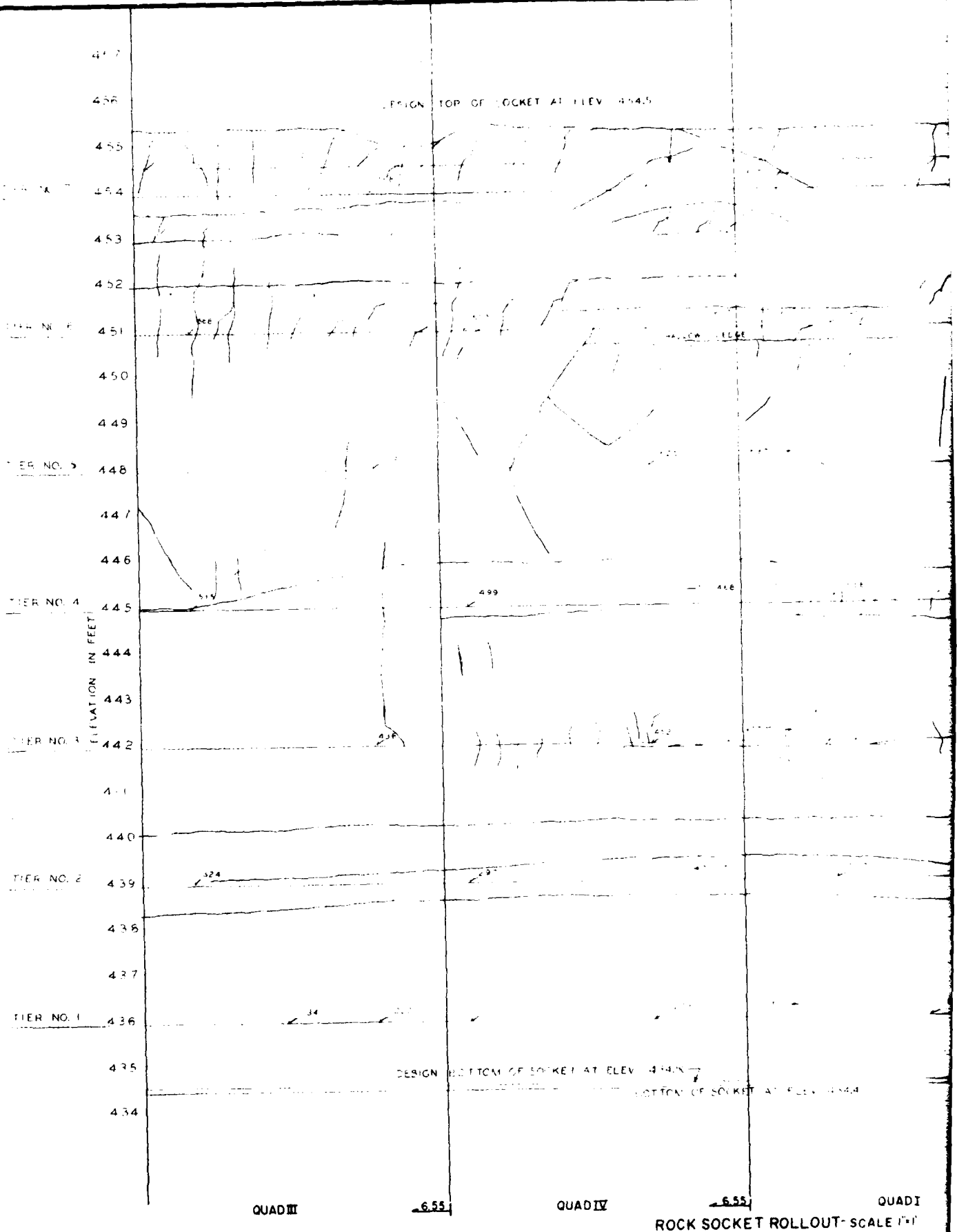
6.55 QUAD I 6.55 QUAD II 6.55
ROCK SOCKET ROLLOUT-SCALE 1"=1'

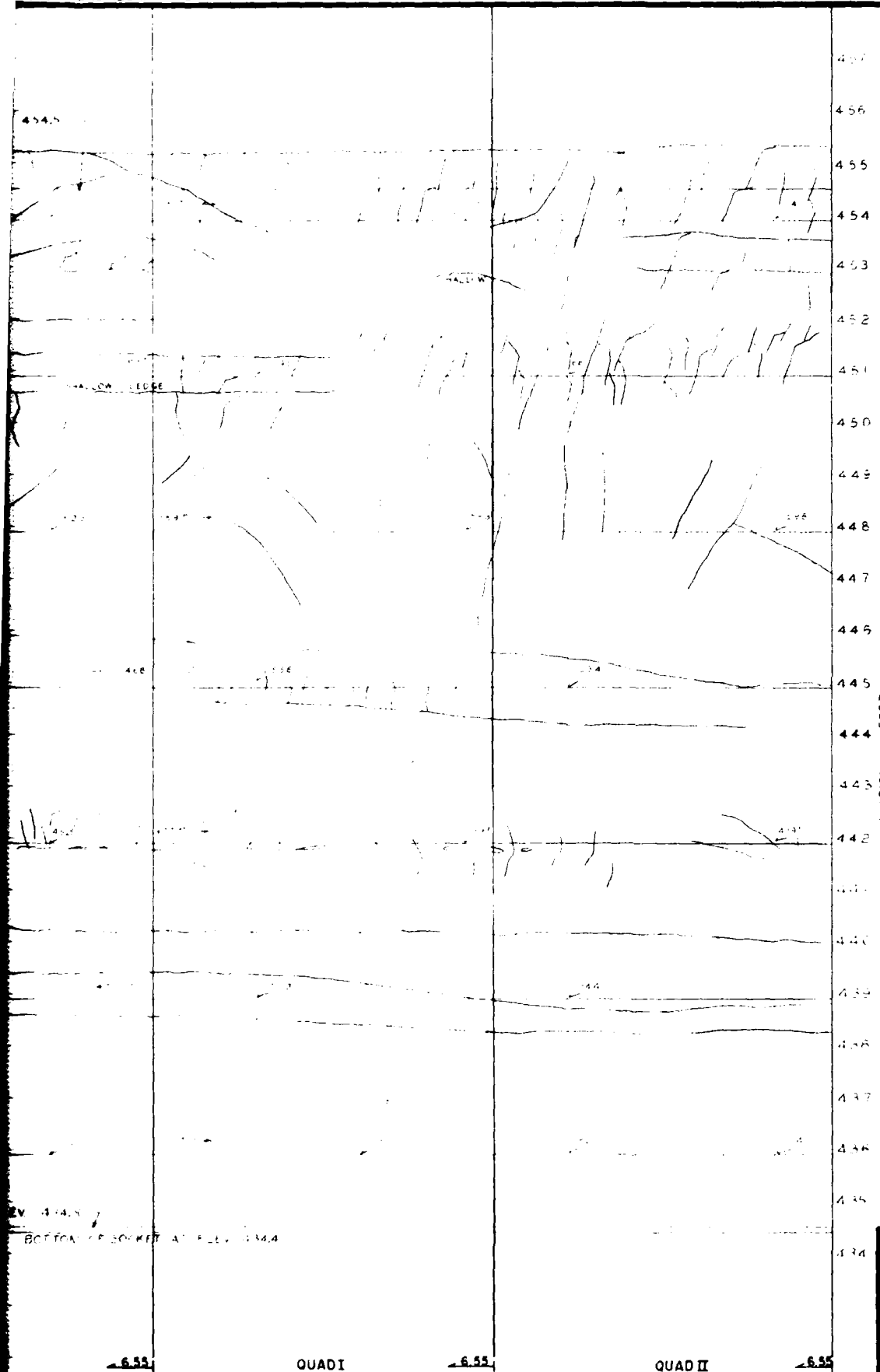


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WORK SAFELY





REFERENCE ELEVATIONS

TOP OF TURN TABLE 445.5
 TOP OF SOCKET 444.50
 BOTTOM OF SOCKET 443.40

EXPLANATION SEE SHEET NO. 2

DWG. NO. 9687-134-3046

INSPECTION - SOCKET FLOOR SHEET A
 CLEAN, SOUND ROCK BOTTOM

DATE OF INSPECTION: 31 OCT & 2 NOV 98
 CONTRACT NO.: DACW03-79-C-0055
 CONTRACTOR: MANNING CONSTRUCTION CO.
 INSPECTING GEOLOGIST: R. L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

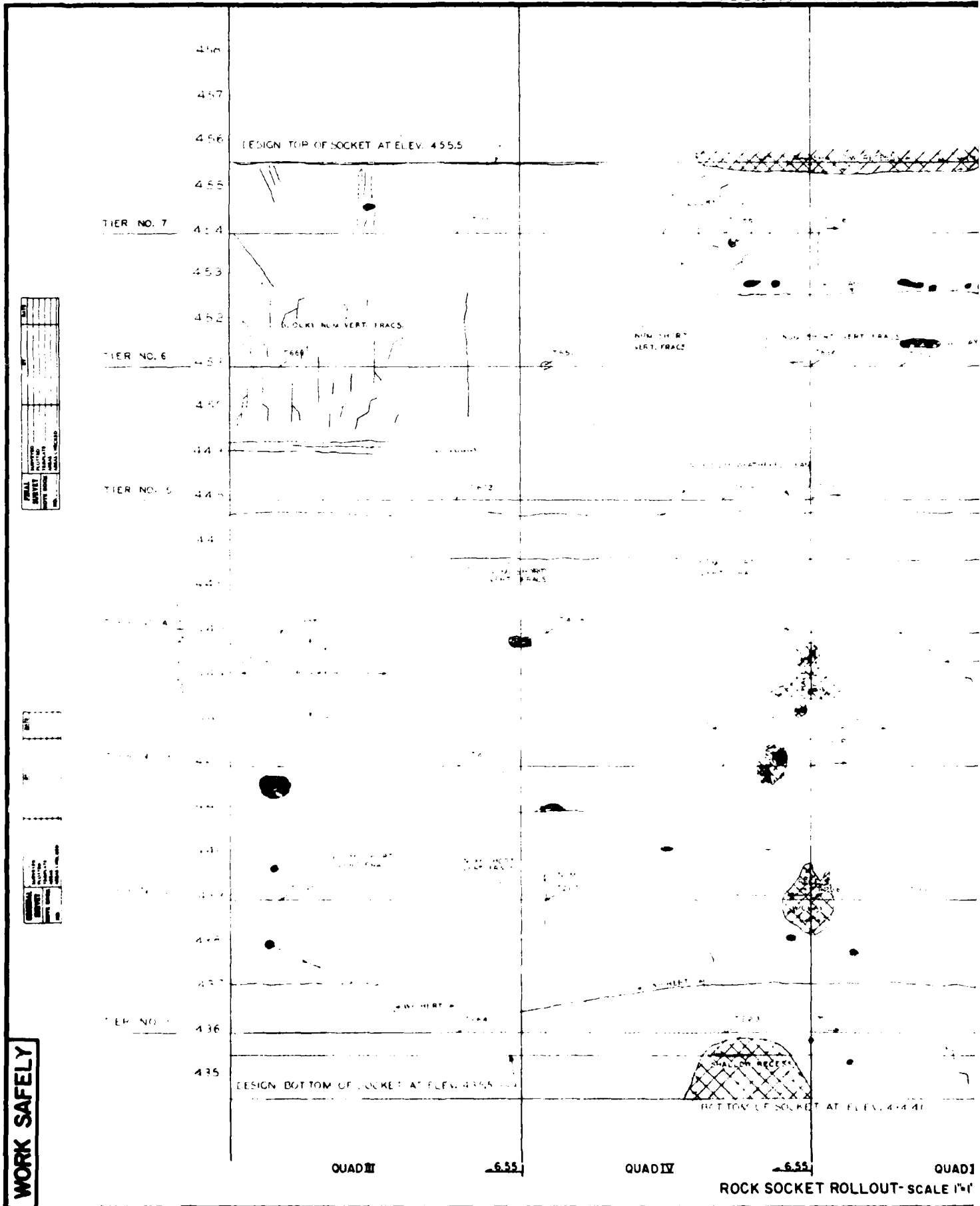
NORFORK LAKE BRIDGES
 ROCK SOCKET INSPECTION
 HWY. 67 OVER R. WEST SOCKET

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| SCALE: | DRAWING NUMBER |
| SPEC NO. | 9687-134/3064 |
| DATE | |
| APRIL 1983 | SHEET 48 OF 52 |

6.55 QUAD I
 ROCK SOCKET ROLLOUT- SCALE 1"=1'

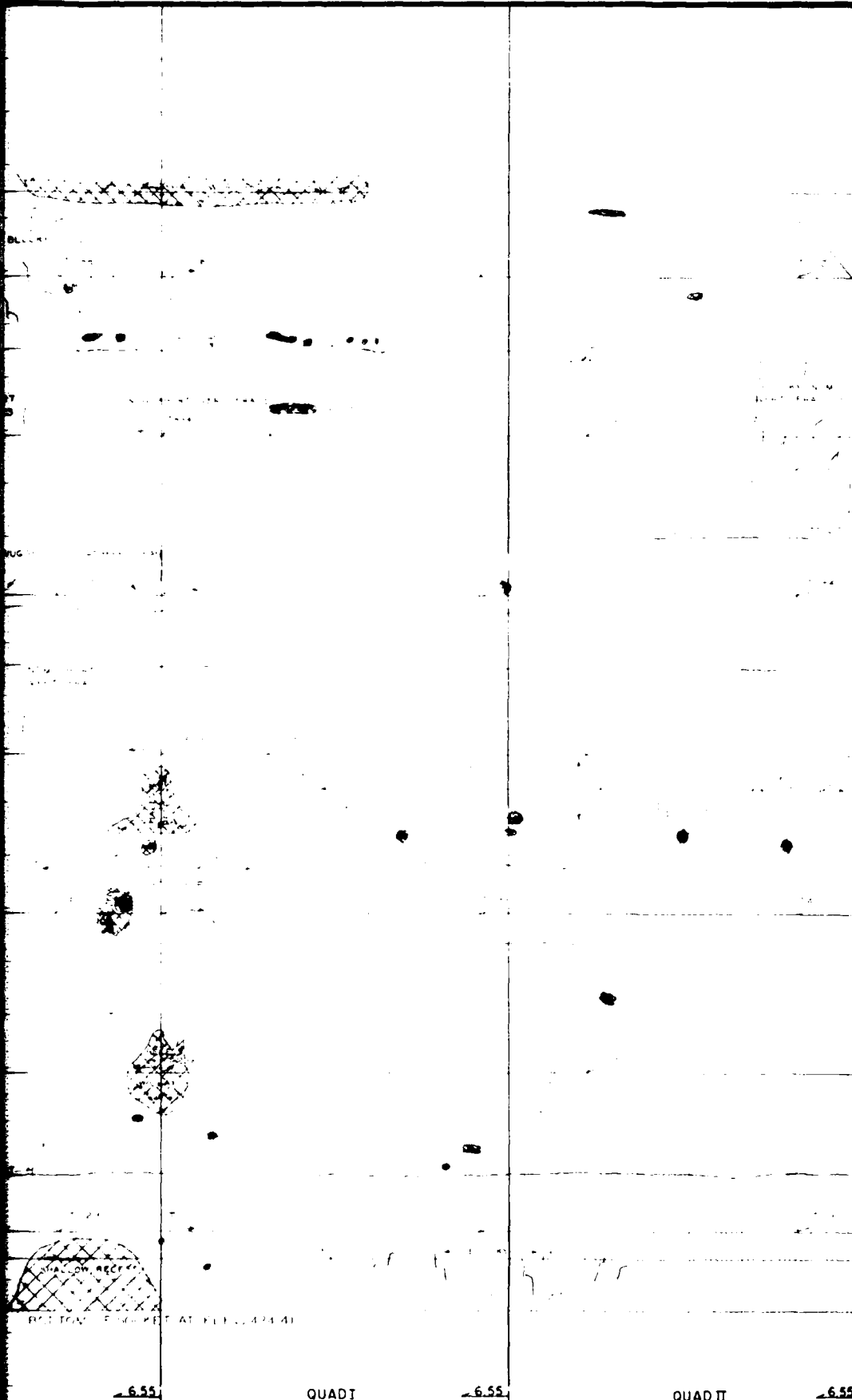
QUAD II

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WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



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REFERENCE ELEVATIONS
 1. SURFACE ELEVATION 455.4
 2. SURFACE ELEVATION 455.4
 3. SURFACE ELEVATION 455.4

EXPLANATION: SHEET NO. 1
 1. SURFACE ELEVATION 455.4

INSPECTION OF SOCKET ELEVATION
 ROCK SOCKET ROLLOUT SCALE 1"=1'
 1. SURFACE ELEVATION 455.4
 2. SURFACE ELEVATION 455.4
 3. SURFACE ELEVATION 455.4

DATE OF INSPECTION: DEC 1981
 INSPECTOR: J. A. WILSON
 CONTRACTOR: MADHAN CONSTRUCTION CO.
 PROJECT: GEOLOGIST: J. E. HARTUNG

DEPARTMENT OF THE ARMY
 LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
 ROCK SOCKET INSPECTION
 HWY 101, PIER 2, EAST SOCKET

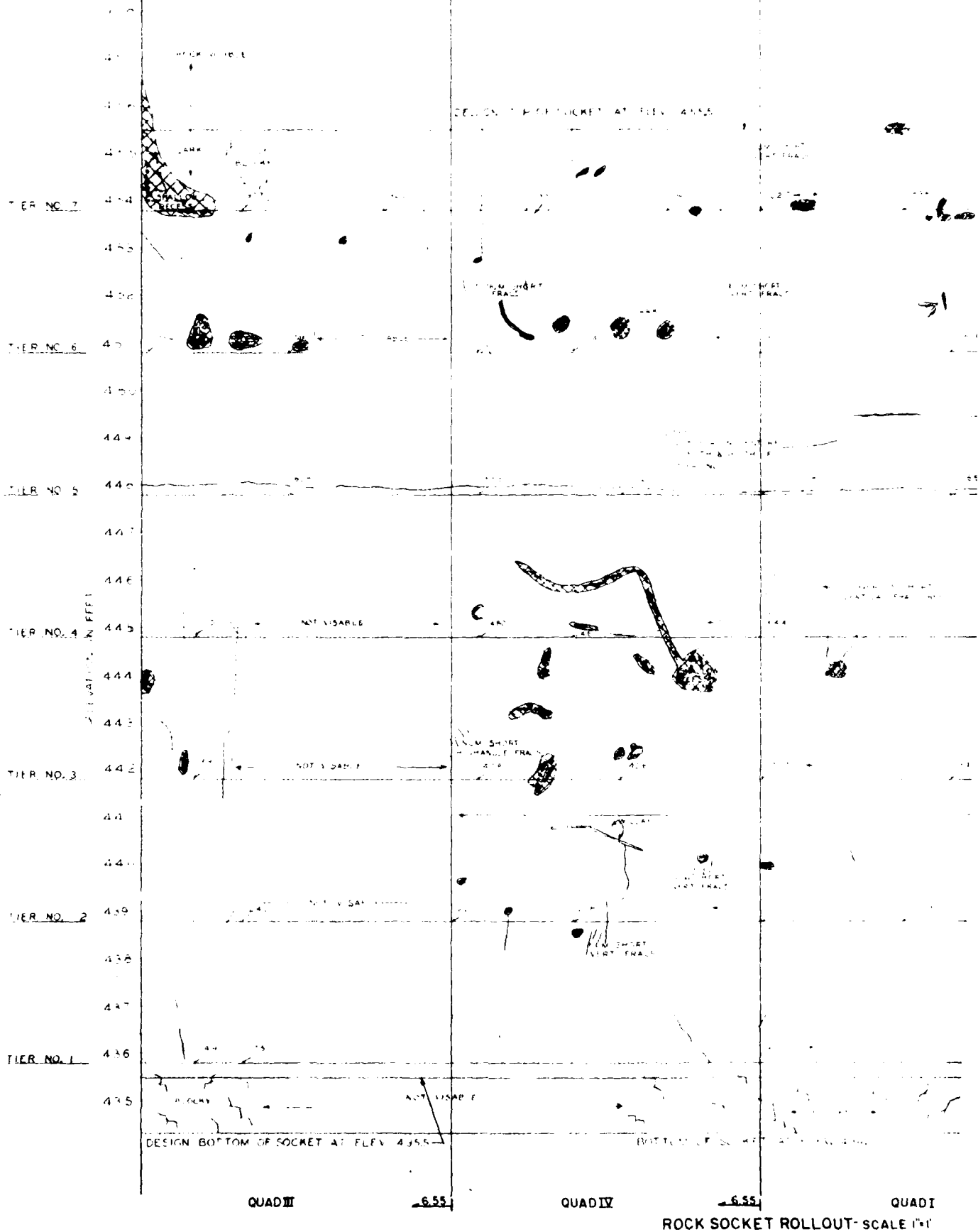
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| SCALE: 1"=1' | DRAWING NUMBER |
| SPEC. NO. | 9687-134/3067 |
| DATE | |
| APRIL 1983 | SHEET 49 OF 54 |

6.55 QUAD I 6.55 QUAD II 6.55
 ROCK SOCKET ROLLOUT-SCALE 1"=1'

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WORK SAFELY



AT ELEV. 4555

PORT FRACK

VERT FRACK

CLAY

ROCK

SOCKET

ROLLOUT

SCALE 1"=1'

QUAD I

QUAD II

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436

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REFERENCE: SHEET NO. 30
DRAWING NO. 9687-134/3046

EXPLANATION: SEE SHEET NO. 30
DRAWING NO. 9687-134/3046

DATE OF INSPECTION: 10/1/68
CONTRACT NO. DAH001-68-C-0055
CONTRACTOR: DAVID MAN CONSTRUCTION CO.
INSPECTOR: GEOLOGIST STEVE HARTUNG

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, FIER 9, WEST SOCKET

SCALE: 1"=1'
SHEET NO. 30
DATE: APRIL 1983
DRAWING NUMBER: 9687-134/3066
SHEET NO. 02 OF 52

EXPLANATION SEE SHEET NO 30
W. N. 96B7-134/3046

DATE OF INSPECTION: 4/2/78 BY
CONTRACT NO: DAHWO 78 C 0055
CONTRACTOR: HATMAN CONSTRUCTION CO.
INSPECTING AGENCIST: STEVE HARTUNG

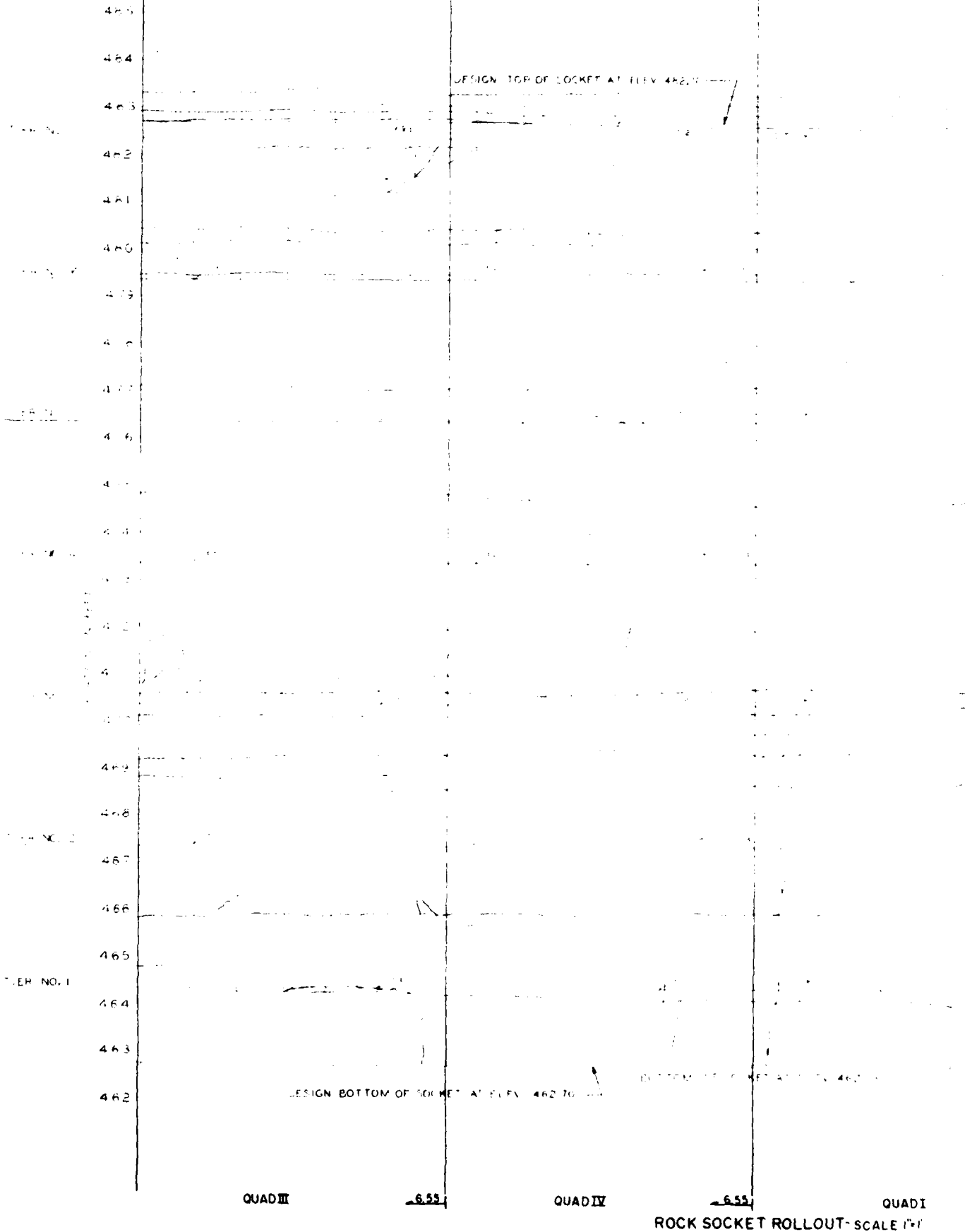
NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 9, WEST SOCKET

| | |
|----------------|----------------|
| SCALE: 1" = 1' | DRAWING NUMBER |
| SPEC NO | 9687-134/3066 |
| DATE | |
| APRIL 1983 | 30817 20 02 52 |

| | |
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| FINAL DESIGN | DATE |
| DESIGNED BY | DATE |
| CHECKED BY | DATE |
| APPROVED BY | DATE |

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| FINAL DESIGN | DATE |
| DESIGNED BY | DATE |
| CHECKED BY | DATE |
| APPROVED BY | DATE |

WORK SAFELY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT

ELEV 482.70

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REFERENCE ELEVATIONS
TOP OF T. ANCHOR 453.38
TOP OF SOCKET 482.70
BOTTOM OF SOCKET 462.70

CONTRACT NO. 9687 134/3046

ELEVATION IN FEET

INSPECTION OF SOCKET FLOOR, SHOWED A COVERING OF OVERBURDEN. AFTER THE INITIAL INSPECTION, AFTER INNER CONCRETE FORMS WERE REPAIRED, INSPECTION SHOWED A SOUND ROCK BOTTOM WITH A THIN SLATTERING OF CRACKS AND OCCASIONAL ROCK FRAGMENTS.

ALL OF INSPECTION WAS BY
CONTRACTOR'S A. W. L. 1955
CONTRACTOR: KANSASMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: DON L. CRUTCHFIELD

| | |
|---|---------------------------------|
| DEPARTMENT OF THE ARMY LITTLE ROCK DISTRICT, CORPS OF ENGINEERS LITTLE ROCK, ARKANSAS | |
| NORFOLK LAKE BRIDGES | |
| ROCK SOCKET INSPECTION | |
| HWY 100, BRIDGE, EAST SOCKET | |
| SCALE SHEET NO. | DRAWING NUMBER 9687 134/3046 |
| DATE APRIL 1967 | SHEET 5 OF 5 |

BOTTOM OF SOCKET AT ELEV 462.70

6.55

QUAD I

6.55

QUAD II

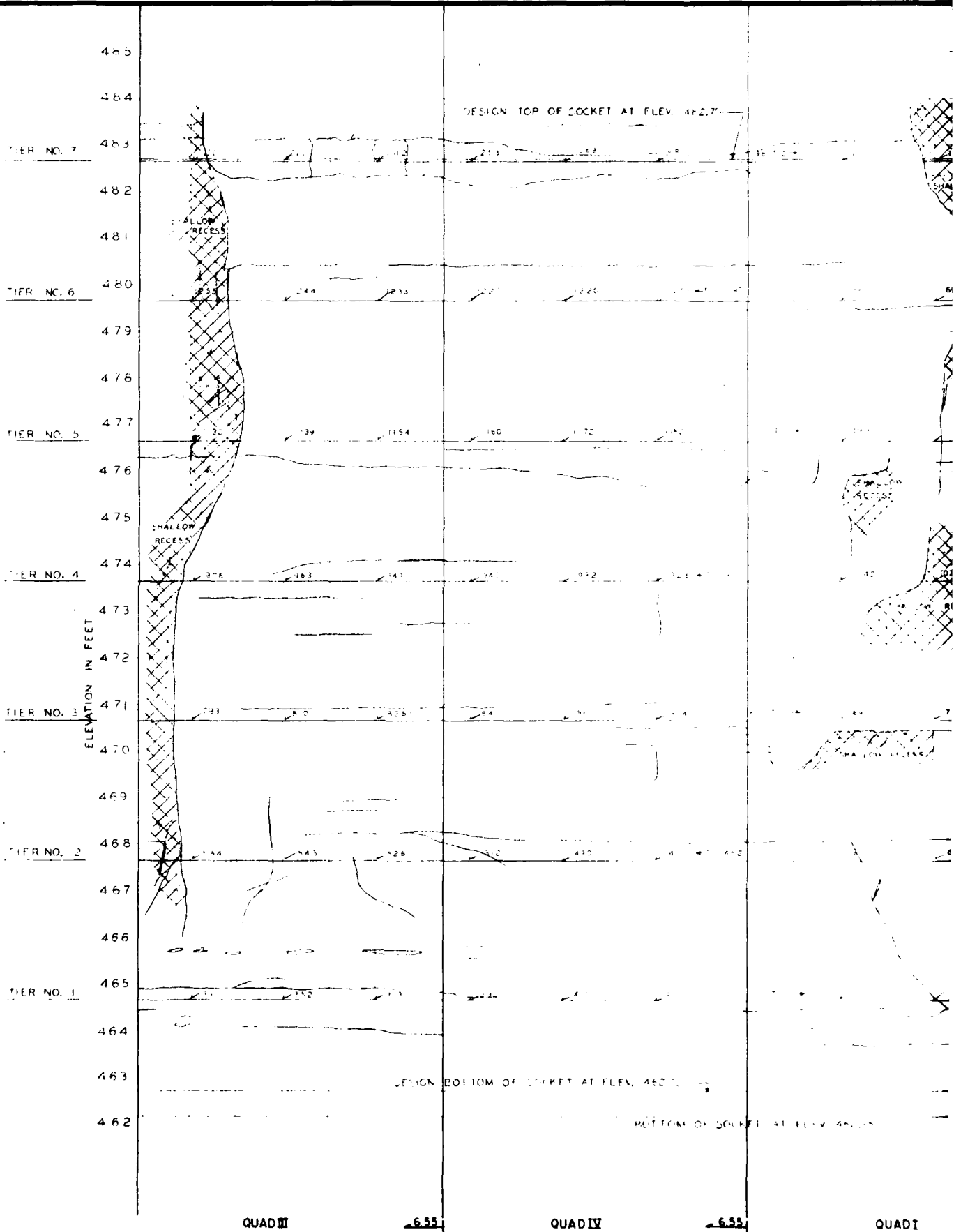
6.55

ROCK SOCKET ROLLOUT- SCALE 1"=1'

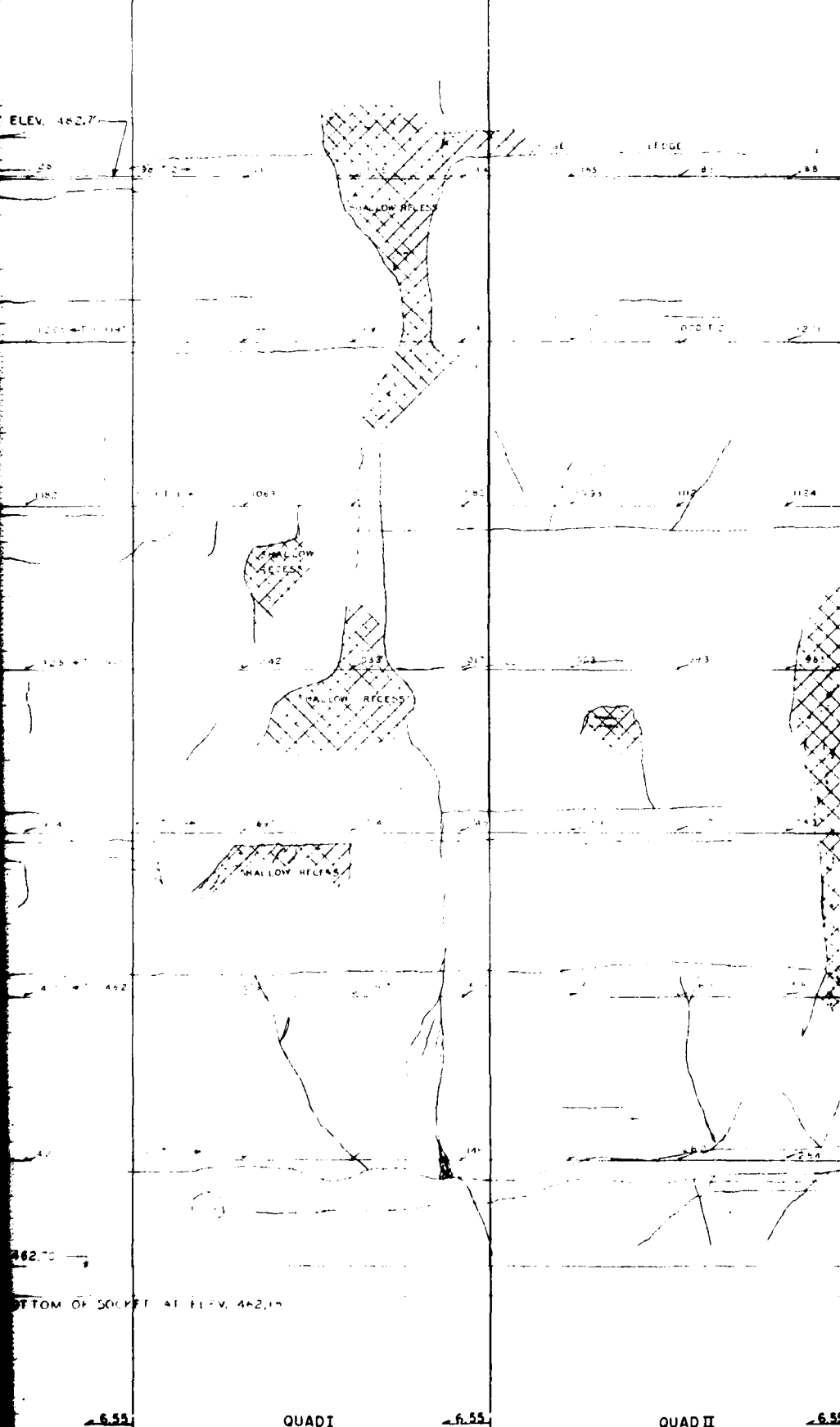
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| GENERAL | DATE | BY | CHKD |
| REVISION | DATE | BY | CHKD |
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| REVISION | DATE | BY | CHKD |

WORK SAFELY



VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS
TOP OF TURN-TABLE 482.8
TOP OF SOCKET 482.70
BOTTOM OF SOCKET 462.15

EXPLANATION, SEE SHEET Y-30
DRAWING NO. 9687-134/3068

THE FOLLOWING INFORMATION WAS OBTAINED FROM A
INSPECTION OF THE ROCK SOCKET AFTER THE CONCRETE WAS
WAS RE-SEALED SHOWING A SHALLOW RECESS AT THE BOTTOM
OF THE SOCKET.

DATE OF INSPECTION: 10 OCT 1968
CONTRACT NO: DACW03-79JC-0055
CONTRACTOR: DAYMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS
NORFOLK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 10, WEST SOCKET

SCALE: 1"=10'
SPEC NO: 9687-134/3068
DATE: APRIL 1969
SHEET 52 OF 52

6.55 QUAD I 6.55 QUAD II 6.55
ROCK SOCKET ROLLOUT- SCALE 1"=1'

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